

# FUTURE OF FOOD

an exploration of the global food system

## What does the world want to eat? Report of the Future of Food seminar

*28th of November 2008, Brussels*

*Chair: Rudy Rabbinge*



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# Introduction

The Future of Food seminar, that is reported here, took place in Brussels at 28th of November 2008.

It focused on the growing gap between exploding consumer demands and the limited natural resources. What could technology offer to bridge this growing gap?

The following speakers contributed:

Sir Gordon Conway, chief scientific adviser of the British Ministry of International Development

Frank van Tongeren, senior economist at OECD, Paris

Roberto Smeraldi, director of the NGO Amigos da Terra, Brazil

Jochen Weiss, professor in food nanotechnology, University of Hohenheim

Kaisa Kautto-Koivula, futurologist with Mind Gardenia, Finland

The seminar was realized in cooperation with Wageningen University and Research Center and was chaired by Rudy Rabbinge, university professor in sustainable food production at Wageningen UR. Partners in realization were the Netherlands Ministry of Agriculture, the Netherlands Ministry of Health and the innovation network Food and Nutrition Delta.

A number of 45 senior experts on global food systems from business, government, science and NGOs, participated in the seminar and contributed to the stakeholder dialogue sessions.

This seminar is the first activity of the Future of Food initiative. Schuttelaar & Partners and Wageningen University aim to develop a stakeholder dialogue on the future of the global food system by means of a series of seminars and a book, in cooperation with organizations and companies that are active in the global food system. For more information: see [www.future-of-food.com](http://www.future-of-food.com)

# Summary

*“I go home with more food for thought than I had before the seminar”, one of the participants said, but it was not a complaint. That was exactly the intention of the seminar. Not to generate answers, but to open up the future and raise questions. Not to forecast or to create scenarios, but to explore time horizons of the global food system in all its broadness and complexity. And to do that in dialogue between experts from business, government, civil society and science.*

The background of the speakers reflected this broad approach. An expert in development cooperation, bringing Africa into the discussion; an economist telling about Asia; a rainforest campaigner from Latin America; a nanotechnologist who recently returned from the USA and a European telecom innovation specialist.

## **Increasing demands and insecurity**

Consumer demands for food and agricultural products will increase sharply in the coming years. Not so much because of an increase in world population, but primarily because of the rise in per capita income, especially in Asia. This means a rise in the demand for animal products, and consequently in animal feed. Within ten years China will account for half of the world's pork consumption and absorb half of the world's oil seed exports to use as feed.

The food processing industry and retail shift to the centre of the global food system. More and more people live in megacities all over the world and have full time jobs. This makes them increasingly dependent of processed food bought in supermarkets. The food situation has to do with different crises. Underneath the surface of the headline issues, a complex dynamic of chronic problems exist, keeping high levels of volatility and uncertainty in store for the foreseeable future. Not only the food crisis and the financial crisis, but also global issues like energy supply, health equity, terrorism and environmental degradation play a role. Overweight is surfacing as a growing problem in an increasing number of countries. Amongst the poor in Brazil for example overweight is a bigger problem than malnutrition.

These crises are closely connected and can no longer be tackled one by one, but have to be addressed simultaneously.

The seminar's dialogues brought up the growing level of uncertainty as a new element in the analysis. Climate change causes global perspectives to become increasingly uncertain. Food price fluctuations are greater than ever. Government policy is able to decrease, but also to increase these uncertainties by their food and price policies.

### *Technology part of the solution*

Because of the tremendous increase in food demands and food production, we will soon arrive at the limits of what the earth can provide. There is no expansion free of charge, no escape in new 'wastelands' to be cultivated. To realise a food supply that is healthy and sufficient for everybody, investments are needed in science and technology. This area has been neglected for more than twenty years. A new Green Revolution in agriculture, this time with a strong focus on equitability and sustainability, is called upon. But technology alone is not enough. Externalities for food production have to be made visible, in order to show their real costs. Only then they can be part of a sustainable strategy.

Technology has to be brought in synergy with government policy. Or to put it more fundamentally: technology should not be the dominant driver, but should always serve a human centred approach. Translated to food, the leading question is no longer "how to feed the world?", but "what do you want to eat?" This is a real challenge for governments, because these are more production oriented than consumer driven. The products of government policy, such as regulations and financial stimuli, should be more consumer oriented.

We have to realise we are making the shift from a large scale industrial-technological paradigm to a more creative network way of thinking, that is both more adaptive to local demands as more global in its organisation. To prepare for its future, the food sector should therefore learn from other areas and open itself for dialogue with stakeholders, in particular the stakeholders on the consumer side of the food chain. Much can be learned from the network approach of innovation by the telecom sector. And from the successful way in which the climate sector has put global warming on the world agenda, by means of the Nobel Prize winning IPCC network.

To live with this huge complexity of interconnected world food issues is an art. To deal with it is an even greater challenge. Our challenge.

Rutger Schilpzand  
Edwin Hecker  
Schuttelaar & Partners



## Presentation Gordon Conway

### *Interconnected crises*

*The world is facing a range of crises. Sir Gordon Conway, Chief Scientific Adviser of DFID, showed in his presentation how these crises are handled and also how they are increasingly interconnected. "The problem is that we only half understand them and we know only half how to manage them."*

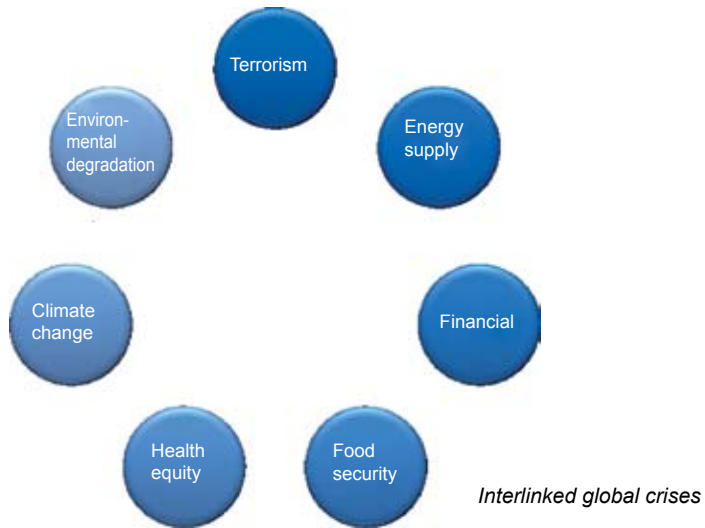
In a way these crises are like an English cottage loaf, with a small bit at the top and a larger part at the bottom. Indeed, we focus almost solely on the immediate crisis at the top, while we tend to forget the underlying crisis.

An example of the interconnection that exists can be found in the most recent food price increase. Oil and food prices went up, while grain stocks shrank and biofuel demand grew rapidly. In addition, the price of fertiliser increased five-fold because sulphur - a basic ingredient of fertiliser - is also essential for steel production. The overall result is another 100-150 million people suffering from chronic hunger.

The underlying chronic crisis is getting worse for a variety of reasons. These include a growing world population, a rise in per capita income and a growing demand for the production of livestock and biofuels. All in the face of increasing water and land shortages, and a slowing down of agricultural production increases.

### *Climate uncertainty*

A common belief is that we actually have far more land and water at our disposal than we currently use, but this is simply not the case. In Africa and Brazil there could be some room for expansion, but this is not acceptable for the sake of preserving the rainforest and other ecosystems that are vital for its contribution to the biodiversity in the world.



As a result of changes in temperature and rainfall, production is predicted to fall by approximately twenty percent globally – but this will not occur in a uniform manner and the impact will vary greatly in different regions. Drought in Africa is expected to increase with rising temperatures, but much else remains unknown. Indeed, it is uncertain what the effect on the Sahel will be, whether the water levels of the Nile will increase or decrease and whether monsoons in India will intensify or not.

### **Second Green Revolution**

In Africa, cereal production remains stagnant at one ton per hectare, whereas the average in Europe is eight to nine tons a hectare. China has succeeded in raising its average cereal yield from one to six ton/ha. The underlying message is that we need to raise more public money for R&D, essential to boosting agriculture in the developing world. In essence, we need a second Green Revolution. The original Green Revolution generated new technologies for farmers and created an abundance of food, helping to curb hunger in Asia. Unfortunately, hunger in Africa is still on the rise. A second agricultural transformation that would increase productivity while being equitable, sustainable and environmentally friendly is essential. We have a variety of methods at our disposal to achieve yield increases. We can continue to increase biophysical inputs – leading to high costs of fertilizers, pesticides and water – or we can use more ecological methods which are more skill and labour intensive. We also have the seed itself, which can be enhanced by using new technologies, to build in sustainability and ecology. This can result in, for instance, increased nutrient uptake and nutritive value, higher drought tolerance or better tolerance to pests and diseases. Mr. Conway

believes in this last possibility, but underlines the necessity to deal with controversies that the use of biotechnology generates.

### ***Increased resilience***

For any method we adopt, the context is vital. Technology on its own is not sufficient, and must therefore be embedded in a specific time and place. In Africa, it is essential that we apply “layered interventions”, consisting of different elements that may vary from place to place. Above all we need to aim for resilience. It is not the crisis itself, but the ability to respond to it that makes the difference. As there will be more crises in the future, the challenge becomes how to place food production and consumption in the context of resilient livelihoods.

In a way these crises are like an English cottage loaf, with a small bit at the top and a larger part at the bottom. We focus almost solely at the immediate crisis at the top. The chronic crisis we tend to forget.



*Built-in resistance to the Diamond Black moth*



# Presentation Frank van Tongeren

## **Pork and supermarkets**

*The OECD has constructed an outlook that offers valuable insights in the main dynamics of the food system for the coming years. Frank van Tongeren, Senior economist for the OECD, presented the outcomes and showed how supermarkets and Chinese pork consumption may come to dictate the food system in the long run.*

## **The long term perspective**

Several factors have led to the volatility in food prices that we are currently experiencing, namely a short supply, low stocks, a strong demand, policy decisions taken in a context of panic and speculation in futures markets. However, all of them are short-term movements. If we adopt a fifteen year perspective, we then need to examine the longer term drivers of change.

The OECD has constructed a ten year Outlook, based on the assumption that the current macro-economic and policy climates remain unchanged in that period of time. Keeping this assumption in mind, the results are very interesting. In terms of change over the course of the next fifteen years, we discover that both production and consumption growth occurs mainly outside of OECD countries. This is where the real dynamism is. Trade will expand greatly for almost all food commodities, and most of this expansion will result in increased trade between developing countries.

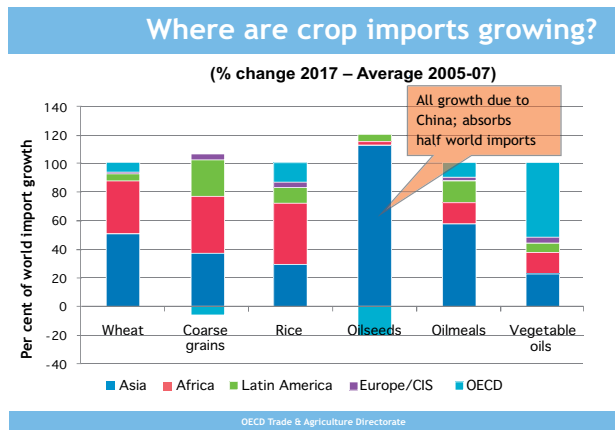
## **China: the meat-feed story**

Rice will remain central to the Asian diet. Consumption and production will dip slightly in China, whereas overall production increases in South-East Asia. Furthermore, Thailand will consolidate its position as world market leader (circa thirty percent of the world market), and India will move toward self-sufficiency. An area of particular interest



is the production of coarse grain and oil seeds. The rise in demand for these products will be primarily driven by the demand for feed in meat production. Figures show that China will absorb half of the world's imports of oil seeds, which will mainly be used to produce pork. South America will become the main supplier of feed for China's chicken and pig industries. Although China has all the potential to be auto-sufficient for grain, the dynamic between its internal feed and meat markets is far from optimal. For instance, while the Northern China exports feed to the world market, Southern China imports feed, mainly from South America.

India will demonstrate a comparable growth of income and a resulting change in diet, but it will be less pronounced than in China. Furthermore, if India continues with its protectionist trade policies, it will have to increasingly rely on domestic production to match rising food demand.



### *The supermarket revolution*

Historically, economic growth has always coincided with a process of “defragmentation” of markets. Indeed, with the implementation of economies of scale and scope, a market that is made up of many small players leads to a less fragmented form of organised transactions. On the consumer side of the market, income growth, urbanisation and the participation of women in the labour force all contribute to the creation of a supermarket-based food distribution system. South America has already seen tremendous development toward this type of model, while Asia has followed with a five to ten years delay.

In Asia, the challenge is to increase product quality and reduce transaction costs in an environment with a poor infrastructure and many smallholders with limited budgets. Change brought about by the private sector is currently leaning toward autonomous and parallel logistic systems, which deal with the entire chain from farm to fork. Therefore, farmers will almost have to “buy an entry ticket” to become part of modern

## Presentation Roberto Smeraldi

*As East Asia becomes the consumer centre of the world, Latin America is going to be the key area for biomass production, be it for food, feed, fibre or fuel. In his fifteen year outlook of dealing with limited natural resources in Brazil and other big food exporting countries, Roberto Smeraldi stated that Latin America could contribute to feed the growing global demand for a while, but actual costs might be high, if we include key externalities.*

### **Pressure on available land**

Growth in agricultural production in this decade, in Asia, was caused for eighty percent by increasing yields per hectare. The pattern of production growth in South America is for 67 percent based on the increase in hectares of farmland. This pattern of an expanding frontier greatly threatens South America's rich biodiversity and causes huge carbon emissions. Cattle ranching also makes a disproportionate claim on agricultural land as it currently occupies eighty percent of it, where it only contributes twenty percent to the agricultural GDP in the region. For the production of beef in Brazil, for instance, we need fifteen times more land than to produce the same amount of pork or chicken.

Looking at the availability of land one can establish that there is enough 'degraded' land that can be upgraded to farmland. However, freshly deforested land is four to six times cheaper: it is free to obtain, offers initial timber revenues and a fertile start.





*These are issues behind the façade of a 'Latin America that feeds the world' that need to be resolved in order to make this role a sustainable one. Comprehensive global certification systems for a sustainable agriculture are not to be regarded as a panacea, but are very much needed as a necessary condition for making improvements sustainable.*

If you want to make sourcing and trading transparent and sustainable, you will need an overall understanding of what sustainability is and an overall institution to certify the chain. Roundtables, that are already in place for a more sustainable production of palm oil and soy, are a good instrument to move towards a shared understanding, shared policies, shared choices and shared practices. But Brazil initiated such an agriculture-wide system for a more general approach and individual roundtables can be accredited to it. Brazil is one of the leading agricultural countries of the world, being first in production of e.g. sugar, orange, chicken, beef and coffee. From this position, Brazil can be a legitimate initial source of this system. Smeraldi points out, however, that certification instruments are important, but we should not expect them to solve the lack of governance or perverse subsidies.

### *The challenges ahead*

Smeraldi sees the role of Brazil within the context of a broad biomass based civilization, more than just economy. This implies an intensification of production as it includes besides food also the production of feed, fuel and fibre. It is a production system powered by solar energy.

On the other hand, food is much more than agriculture. Talking about the future of food requires thinking about the way we want to live and the way we want to preserve culture, diversity, health and quality of life across the planet. Smeraldi noted how obesity now comes even before hunger as a cause for diseases, also among the poor, in his own country. World consumption has shifted away from cereals, roots, tubers, beans and moved towards more fat, sugar, meat and dairy.

Disruption of terroir, of culinary tradition and cultural competitive advantages are fast-growing phenomena in the last couple of decades. It is time for a new physiology of taste, rooted in terroir and culturally diversity.

Producing more food does not alleviate hunger. Actually, according to Smeraldi, it sometimes contribute to it, by displacing rural people. The challenge ahead is not producing more food, but rather how to produce the right food, in the right place, at the right cost including the real externalities, and providing access to those who most need it. These are the lessons from the recent climate and financial crisis, showing that it is not sensible to anticipate the consumption of either the environmental space or the financial resources of the coming generations.

# Presentation Jochen Weiss

Technology helps to shape the future of the world food system, but not alone!

*New technologies have made it possible for agriculture to keep pace with the tremendous increase in world population that has more than tripled over the course of the twentieth century, and technology is once again expected to provide solutions for the challenges that lie ahead of us. In this context, Jochen Weiss, professor in food nanotechnology at the University of Hohenheim in Frankfurt, gave his perspective on the impact of new technology applications – such as nanotechnology and biotechnology – on food supply over the course of the next fifteen years.*

## **The Nano evolution**

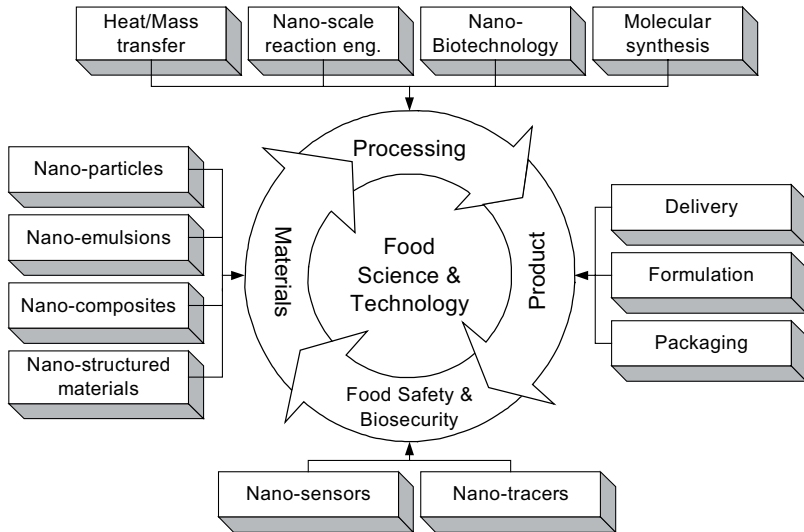
Nanotechnology is an evolution - not a revolution as was predicted during the 1980's – deriving from such disciplines as chemistry, physics, interface science and micro fabrication. The prefix 'nano' refers to the specific properties and behaviour of processes and material structures at  $10^{-7}$  –  $10^{-9}$ m. In relation to food science and technology, nanotechnology has evolved into a conceptual framework that enables the design of more complex structures using nano-scale building blocks, and thereby constitutes a paradigm shift from traditional food manufacturing – the results of which are yet unknown.

## **Nanotech is already part of our daily life**

Nanotech is already present in technical and household products. Indeed, nanotech devices are used as catalysts in petrochemical refinery, as “data collectors”, in cosmetics and tennis racquets and in the fabrication of stain resistant textiles.



## Applications of Nanotechnology in Food Science and Technology



The use of nanotechnology in the food industry can lead to a multitude of applications. For instance, porous nanofibers give an extremely high surface to volume ratio and can therefore be used where enzyme immobilisation is required. In the field of food safety, nanotech bio-molecular sensors are developed for food pathogen detection, proving far more rapid than other conventional methods. Functional food ingredients derived from nanotechnology have the potential to be very different components with different functions. Examples include micro-emulsions with varying characteristics, liposomes and nanoparticles which form the basis of modern anti-cancer drug delivery systems.

### *Nanotechnology can make processes more efficient*

Nanotechnology has various implications for a world with diminishing resources, especially in developing countries. Its application could enable better use of natural processes (i.e. self assembly or 'assisted' assembly), resulting in less labour and energy intensive production. It could also help to improve the use of previously underutilised resources and materials to achieve both current and new functionalities. The art of using nanotechnology lies in its initial design and its functional structure, and less in the actual process.



### *The virtues of nanotechnology*

An important question to ask is whether nanotechnology can bridge the gap between consumer demand and diminishing resources. The following examples help to answer this question:

With respect to diminishing resources, nanotechnology can be used for:

- Saving energy: nanofabrication processes may require less energy consumption than traditional processes, resulting in substantial energy savings.
- Less production of waste & increased sustainability: raw materials may be used more effectively, while materials that were not used previously (as a result of performance issues) may come to be used (e.g. wider use of cellulose based renewable materials);
- Water usage & purification: while probably having only very limited impact on the overall usage, nanotechnology does have the potential for improving water purification methods.

The impact of nanotechnology on growing consumer demand can be:

- Healthier food: nano encapsulation will be a key tool for incorporating bioactive ingredients into food, while new structures may also help to hinder the performance of 'less healthy' ingredients (e.g. fat reduction, replacement)
- Safer foods: Food safety may be improved with enhanced detection methods.

### *Consumer driven developments*

Currently, the development of nanotechnology is being stimulated by scientists and not by consumers, while information pertaining to the benefits and the risks of this technology are not being effectively communicated to the public in general. This could very well generate a scenario in which nanotechnology is not used to its full potential.

Therefore, "there is a strong need to increase the involvement of industry, government and consumer organisations in the debate on nanotechnology. This needs to happen immediately and will be the major focus of the next ten to fifteen years while new applications are being developed."





*Kaisa Kautto-Koivula  
showing her first  
generation mobile  
phone*

## Presentation Kaisa Kautto-Koivula

### *ICT leads to new ways of thinking*

*“Developments in information and communication technology (ICT) have not only deeply influenced business, but have had a significant impact on our daily lives”, affirms Kaisa Kautto-Koivula, Managing Director for Mind Gardenia Ltd. and former futurologist with Nokia Corporation. Indeed, this technology has opened a very large window of opportunity for both economy and society, bringing with it new ways of working and thinking. For Kautto-Koivula, ICT development will bring profound change to the food industry, where “the pace of change is extremely rapid and expectations are high.”*

Technology will also profoundly affect the way we organise our daily lives. However, our current mindset is heavily influenced by the industrial perspective, and increasing work pressure means that we lack time and, so to speak, “grow fat with information”. We therefore have great difficulty in changing our practices and way of thinking. Yet, according to Kautto-Koivula it is imperative that we do so, and “in order to move forward, we need to understand the bigger picture.” We will then understand how technology is a vector of change, in conjunction with many others.

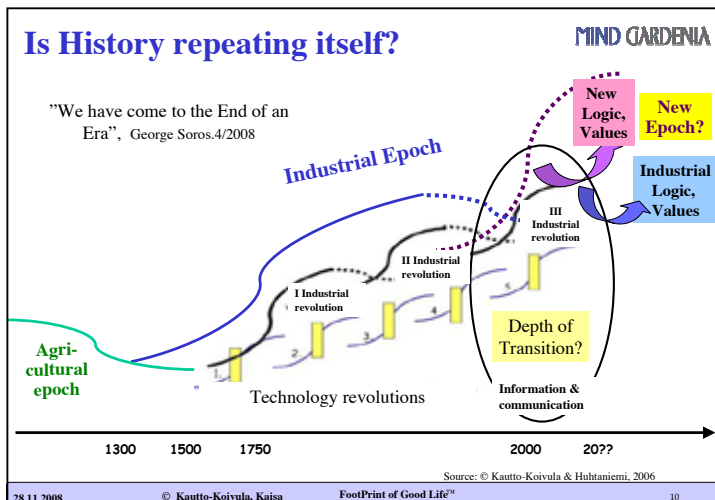
### *The creative economy*

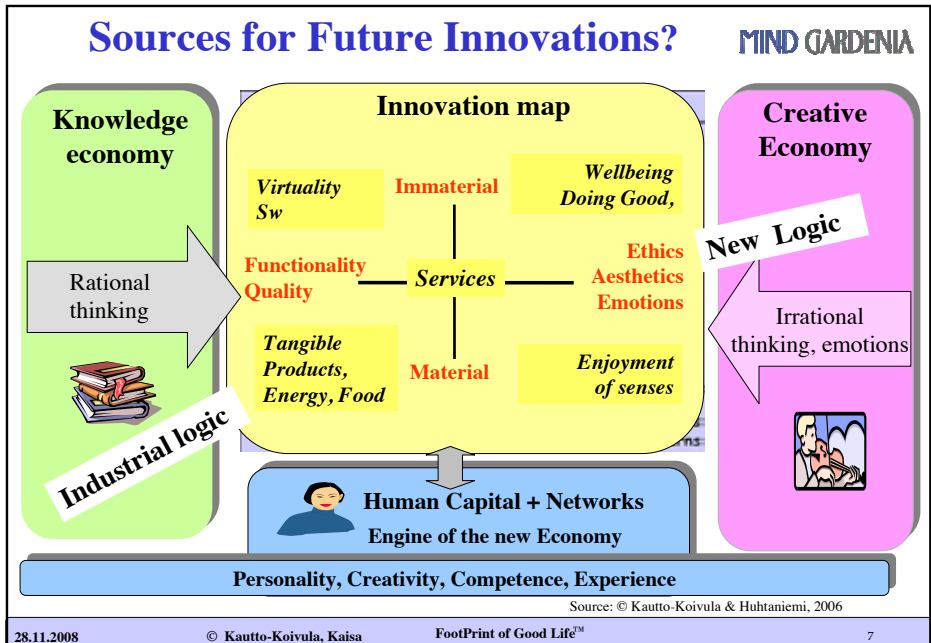
Stepping into the future will bring both big challenges and opportunities for all sectors of society, such as economy, governance and the daily life of human beings, and will require us to add an element of creativity into our rational way of thinking. Indeed, according to Kautto-Koivula, we are heading toward a creative economy that will have

far more room for an emotional and irrational element than our current highly rational economy. The question then becomes how to translate this development into the food sector? As Kautto-Koivula mentions, “Your children are already a part of the virtual world. But where are the food companies? For instance, is your company represented in ‘Second Life’?” She goes on to explain that at present we are in the biggest transition period of the last hundred years, as we are moving from the industrial epoch into a new era. This calls for a radical new approach by society and the industry sectors – including the global food system.

### **The end of the industrial paradigm**

For Kautto-Koivula, this paradigm shift means that we start to shift from the industrial model and all that it entails, for instance materialism, large hierarchical organisations, factories, and people and nature perceived as objects, to a new model that calls for immaterialism, creativity, the power of networks and people and nature as subjects. The period of deep discontinuity that will result will bring many challenges to every sector, but also create huge opportunities for the frontrunners of the future. The change will require that we clearly comprehend the functioning of the new system, and that we adopt a holistic vision and approach based on a human-centric view of the world. Consequently, we will have to develop a global strategy for the food sector, which will necessitate structural renewal of economies, as well as changes in work practice and organisation of daily life. Furthermore, biotechnology, nanotechnology and information technology will need to converge, and global initiatives - comparable to those undertaken to tackle global warming – will have to be developed. According to Kautto-Koivula, if we manage to achieve this change “a better place will be created for future generations to live in. Instead of an unsustainable FoodPrint, we can leave a FootPrint of Good Life to our Children.”





The Knowledge Economy and the Creative Economy are both contrasted and supported by each other in this picture.

It shows that one needs a different type of logic and thinking in the creative economy, compared with the rational thinking in the knowledge economy. This may be an indication of the difficulty of switching from production thinking to consumer demand thinking. Both sides are needed to develop a fruitful innovation process.

# Dialogue A

**The discussion started with the relation between the public and private sector. In the food system it is important to determine who is responsible for what. There was agreement on the fact that the market space has to be defined by clear public borders. What is the public responsibility that limits private acting?**

## *Relation public and private sector*

The example being set was Cargill, that trained two million farmers in China. "Are we the best deliverer of this service?", the Cargill spokesperson wondered. An important question within this respect is: what is the public responsibility that borders private acting? For instance, the Common Agricultural Policy (CAP) needs to go beyond the borders of Europe, as the EU is part of the global system.

## *Food sovereignty*

*"The food crisis affects one in fifty people in the world."*

Poverty is not only the cause, but can also be the effect of lack of sustainability. "Eighty percent of unsustainability is due to poverty, twenty percent to lack of resources." Africa within this respect is of main importance. Due to poverty people are focused on the short term. Often this results in unsustainable behaviour, like the overuse of pesticides, nutrients and water.

Food sovereignty is an important issue as there is a need for policy making on public stocks of food. An important question therefore is: how to realize a minimum level of stocks that could stabilise the world market? There is, for instance, an urgent need to monitor the grain flows all over the world.

## *Urbanisation and globalisation*

The combination of urbanisation and globalisation is an important driver to shape future developments in food. Urbanisation creates the need for food that has to be transported and stored. Globalisation is important due to the increasing amount of food miles and its incremental effect on natural resources. On the other hand it was suggested that most of our food is still regionally produced and consumed. Brazil's dairy production, for instance, is self-sufficient and also 95 percent of China's dairy is produced in the country itself. Future developments in meat consumption are also of main importance. If the Chinese would consume equal amounts of meat or more than the US citizens, this would lead to a huge challenge on energy, water and environmental issues. Various experts in the group agreed that top-down policies are not the most favourable solution. The way forward enfolds better technologies in order to make better use of our resources and to internalise costs for environmental and social issues.

### Quantity and quality

Technology is important to increase yields. Besides the quantity of food it is also very relevant to take quality of food (nutrients) into account. According to various experts it is crucial to invest in health and vitality of food for the wellbeing of the world. The consumer's position on this matter is very important: "It is all about raising consumer awareness on health and sustainability issues." Entrepreneurial spirit is seen as another crucial driver. We shouldn't think too much in terms of 'systems', it is all about people and entrepreneurship. Additionally it is also important to notice that there is no 'one recipe for the world', since many drivers are very region specific.

### Technology: a human-centred approach

*"The food industry must learn to talk with human beings instead of communicating to consumers."*

Two directions in leadership were distinguished: putting technology in the centre, while noticing that we do not know where we are heading to, or choosing a more human-centred approach. Technology can make a change, however it is a driver that is connected to many others. In order to understand how to move forward it is of main importance to understand the bigger picture.

People eat food and therefore they have to be involved in the process. People more than ever want to know what they eat. Multinationals like Nike and Nokia involve users in the process of designing products. The food industry might also benefit from a more human-centred approach, that starts with needs instead of commodities: "we should talk about food, not about products."

One of the experts mentioned the Brent Spar case of Greenpeace versus Shell, as an example of a non-rational debate. It was indicated that emotion is a very important challenge we have to take care of in our approach: "we have to deal with perception." Populism in this context can be a pitfall. It is therefore crucial to communicate facts to the public. Consumer trust is essential. Thinking in black and white should be left behind: "we have to learn that it is not artificial against natural. We have to combine the various modes of thinking." Stakeholder dialogue is therefore a very useful tool to exchange ideas.

## Dialogue B

The participants in group B were looking to achieve a better understanding of the factors and processes involved in food production. Furthermore, they were seeking to outline priorities for the future, and to identify the stakeholders involved and what their responsibilities should entail.

### *Basic conditions*

The discussion began by characterizing the desired changes for both the supply and the demand of global food production. On the supply side, emphasis was placed on the fact that creating a sustainable future for food requires finding solutions that involve all producers, including millions of smallholders in Africa, Asia and Latin America. On the demand side, the discussion highlighted that solutions based on altruism and an enlightened sense of awareness from consumers are bound to fail, as greed and the quest for self-enrichment are usually predominant. Therefore, pragmatic approaches are essential.

### *Interconnected crises*

*“The era for addressing one crisis at a time is over.  
They need to be addressed simultaneously.”*

Gordon Conway's presentation on interconnected crises was well received by participants, who put forward several observations related to the future of food. One of these underlined how population growth is often stressed as the factor behind an increased demand for food, while better nutrition, better education, and lower child mortality are proven factors in reducing population growth. An increased pace of development can have an important effect on long term population growth. Changes in the agricultural production system occur over periods of five to ten years. Financing and investment should reflect these long supply and demand interactions. The current credit crisis forces investors to go short. This resulted in enormous price hikes as the production system is not flexible in its supply. A volatile world will make long term investment increasingly difficult.

Including smallholders in the food system, is an issue that is also connected to the financial system. Smallholders do not have access to financial services. Even the microfinance revolution seems to pass over smallholders. According to the bankers present, it is about overall risks, not the financial system itself. Therefore, once the risks are reduced, financing will come available. This argues for more resilience amongst smallholders and improvements to national juridical systems and macro-economic policies.

### ***Consumer demand as the vector of systemic change***

According to one expert, in past decades the market for agricultural products was supply-driven, while more recently a major shift toward a demand-driven market has occurred. This type of change requires that a clear distinction has to be made between the notions of production and consumption; in other words between the questions “Can we feed the world?” and “What do its inhabitants want to eat?”. Currently, the key to a sustainable future can be found in the answer to the latter question, which also implies that international agreements, policies, subsidies, education should be more focused on the consumer side of the global food system.

Although greed and egocentrism were mentioned as factors related to consumer demand, the softer notion of “maximum utility” was also put forth. In terms of demand, the possibility for change lies in the dynamic between consumer preference and the supply of sustainable consumer products. It therefore becomes imperative to improve the awareness of consumers, and to channel their demand toward a sustainable food system. In more developed economies this can, in principle, be achieved through education and awareness. However, it is almost impossible to induce change in the consumption patterns of the rising middle classes in growing economies using this method. Therefore, a strategy must be developed to help channel consumer choice through a combination of information, which generates awareness, and adequate pricing, which determines the consumer’s maximum utility of a product. This requires us to redirect the focus of our policies from the supply side to the demand side. This also implies that subsidies become more demand focused.

### ***How to achieve full cost pricing?***

Current prices do not reflect the real costs of products, as these do not take into account the many externalities generated by the production process. These externalities often have negative social and environmental effects, which are not included in the final price of products. Therefore, labelling alone is not perceived as adequate, and must be accompanied by readily available information – one of the main enablers of full cost pricing. Information can be generated via a transparent food production chain – that helps to identify and remove externalities, and a sound definition of the term “sustainability”. Indeed, in order to render the entire food system sustainable, a clear meaning of the word must be developed and communicated at all levels, thereby allowing for informed choices and the creation of appropriate policies.

Roundtables can be a good method for achieving mutual understanding, as well as shared policies, choices and practices, as long as these are organised in conjunction between governments, the private sector and societal groups.

In addition to generating change in conventional business practices, the market for sustainable food products is also an opportunity for innovative new businesses to create new product possibilities in response to demand preference. These businesses are perceived as the way of the future, and by creating the right environment for their initiatives, policy making in this area may become less of a priority. Ultimately, it is the creativity of producers that can be a vector of change in the transition to a demand-driven sustainable food system.

### ***Food processors and supermarkets***

*Food is what comes to you on a plate"*

A remark that was heard several times, but was not really addressed in the discussion is on the big gap between agricultural produce like rice, wheat, and soy and the food products that determine consumer choice. The food producers change agri products into food. They add the cultural dimension, decide where to source their input and where to sell their products. The food processing industry and the supermarkets, as has been said, are probably the most important links in the food chain, that translate consumer food demand to a demand for agricultural products. Therefore, in its sourcing policy, the food processing industry can have a substantial impact on biodiversity and on the inclusion of smallholders in the production system.



## Dialogue C

**Participants in Group C – from business, science and government – all had direct links to the food system through their areas of work, which included obesity, sustainability, agriculture, health, climate change, food security, fair trade, market measures, ICT, organic production, technology, risk management and development aid.**

It is a known fact that the global demand for food will increase sharply as a result of demographic changes (population growth and urbanisation) and an increase in living standards and wealth of producers and consumers. In developed countries, consumers often want and buy more than they actually need – a “need” which is most often culturally driven. Furthermore, important information on healthy and sustainable choices pertaining to basic needs is often absent. As a result, consumers are often unaware of such things as the appropriate daily intake of nutrients and how and where food is produced. The food industry can be of remedy to this problem by helping consumers to make healthy and sustainable choices. As only five percent of the world food supply is produced by the top ten food companies, the presence and importance of small and medium enterprises (SMEs) is obvious.

The role of retail becomes more and more important as a ‘director’ of food chains and quality levels. Not only in the western world, but its presence and importance is growing rapidly worldwide. Also the retail sector has the possibility to empower consumers to make sustainable choices.

### *Land claims*

How can food producers respond to rising consumer demand? While arable land is limited in quantity and not easily expandable for the sake of preserving biodiversity, pressure on it is increasing due to the growing number of competing land claims. It is needed by agriculture for food and feed production, and more recently for crops used in energy production. Furthermore, cities, which require vast areas of land for their infrastructures, are often located on fertile soil. Expansion of arable land is limited, because the remaining nature has to be conserved for the sake of biodiversity and climate.

Therefore, land is scarce and quickly becoming a global commodity. A prime example is the recent lease agreement between South Korea and Madagascar, whereby South Korea has ensured its food security for the long term. In many cases land is used in an unsustainable way. Much effort is necessary to counter the problem and turn to sustainable harvesting. Change is urgently needed, and the issues of land scarcity, water shortages and rising CO<sub>2</sub> levels must be addressed.

It is obvious that technology will play a vital role in agriculture, by helping to increase yields and to improve processing and conservation techniques. However, the use of

technology is not an effective solution without the implementation of sound government policies. For instance, investment in soil enhancement – enabling an increase in yield per hectare – is dependent on suitable arrangements of land ownership. Policy decisions are the determining factor behind proper land rights and allocation of land to the variety of competing claims. Furthermore, governments need to make sure that sufficient investment - both public and private – is made toward agricultural research, as it is an area that has long been neglected, resulting in decreased yields per hectare for many crops.

Infrastructure is another field where increased government investment is needed – so as to link both farmers to regional or global markets, and remote regions to each other. A prime example of where this is not happening is China, who exports agricultural products from certain regions globally, while importing these same products in other regions.

The group concluded that generalised approaches and solutions have limited value, as most factors that increase the gap between consumer demands and natural resources are regional specific. Moreover, these factors have a different impact in each region. Various approaches therefore need to be developed to correspond to local particularities. Even more important is to invest in resilience of the food system, i.e. the level of adaptation to stress. Is the food system able to find answers for coming challenges that are yet unknown?

### **Uncertainty**

During the debate, uncertainty was identified as one of the most important factors of food system developments, as its repercussions are manifold. Uncertainty increases with lowering world food stocks that should play a role as strategic buffers. This leads to the sharp price fluctuations that have been witnessed over past years. Uncertainty is further enhanced by very different factors as climate change, leading to increased number and power of adverse weather conditions, and by consumers' insufficient knowledge on many aspects relating to food. Knowledge dissemination could help a bit, probably.

Furthermore, the current financial crisis generates even more uncertainty at many levels, including the global food system. Special attention must be given to sovereign wealth funds, as the billions of dollars of capital that China and several oil exporting countries have amassed will flow towards new areas and are expected to play an important – yet uncertain - role in coming years. The right to food may be severely challenged in an uncertain environment, as history painfully reminds us. However, democracy can help to create stability and a more stable food supply, thereby helping to disseminate the right to good, safe and healthy food.

## *Climate*

If we compare the global food system with our climate system, it is obvious that the general public is very much aware of the influence that society has (and will have) toward climate change, and is therefore in full acceptance of the mitigation and adaptation strategies proposed by governmental bodies. On the other hand, the food system is not particularly well understood, and it is imperative that the debate concerning its future and the development of global strategies on food change be brought closer to the public sphere. The need for such strategies is not currently felt at a general level, as food problems have yet to become a reality in the developed world. Nevertheless, it is vital to anticipate difficulties in food, and the IPCC model could be a starting point for a worldwide food strategy dialogue.

## Future of Food Initiative

This seminar is the first activity of the Future of Food initiative. Schuttelaar & Partners and Wageningen University aim to develop a stakeholder dialogue on the future of the global food system by means of a series of seminars and a book, in cooperation with organizations and companies that are active in the global food system.

For more information: see [www.future-of-food.com](http://www.future-of-food.com)

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