

Everything starts with light. Photosynthesis, capturing the light from our nearest star, forms the basis of life. Solar energy is our only truly sustainable resource. Man's ability to harness that energy systematically through agriculture and fossil fuels has changed the world in fundamentally.

We have populated the earth with unprecedented numbers, at unimagined levels of consumption and freedom. We are the most successful species on earth, even if one in seven inhabitants still suffers from malnutrition and poverty.

This comes at a high price: the alteration, and sometimes the destruction of terrestrial and marine ecosystems, affecting biogeochemical cycles including the climate system. However, the highest price we pay for our past success is the growing distance between agriculture and public understanding of how food comes to the table. History proves that the tremendous gains in material conditions are, without exception, based on a mastery of ecological, chemical and physical processes as well as genetics.

But among the middle classes in the OECD countries, in particular in Europe, technological optimism has been replaced by profound distrust of innovation, especially in some life sciences. The reliance on science as a key human endeavour has eroded. This stands in great contrast to many developing economies where, at least for now, science is considered an essential instrument of progress and hence investment in science remains uncontroversial.

The lack of trust in science is not new. On the contrary, most of human history has been marked by adherence to the religious and worldly authorities. Collective fear and darkness dominated, rather than open enquiry. This changed from the late 17th century onwards, when individual rationality and scientific methods entered the scene, in a movement known as the Age of Enlightenment.

It meant a revolutionary change in world view: from superstition to

the belief in the capacity of human reason and learning to change society and improve wellbeing. And indeed, thanks to the Enlightenment scientific methods evolved into today's multitude of disciplines. Enlightenment reversed the fears even it continued to co-exist with prejudice.

Fast forward to 1959, when C.P. Snow delivered his famous lecture *The Two Cultures and the Scientific Revolution*, about the misunderstandings between the sciences and the humanities. That rift is far from gone, and it plays out specifically in the realm of food and agriculture. Scholars in the humanities rarely have an idea of, say, why it is rational to produce beef on pastures, let alone of the difference between the digestive systems of cows and chickens. And how many of you here read modern novelists or are aware of the concept of freedom promoted by John Stuart Mill. You may ask: so what? Apart from the pleasure one derives from history, philosophy and the arts, I firmly believe that a broad view of society makes one a better scientist and student.

In this century, however, our problem is not simply a rift between the humanities and sciences. We live in times of incredibly fast scientific progress surrounded by an ever more sceptical and pessimistic environment. Today's Two Cultures point to the profound difference in perspective between scientists with their optimistic 'Yes, let's try!' approach and the public's 'No, it may be dangerous!'. It seems easier to believe an internet full of unfounded accusations than peer reviewed science. Sometimes, science itself seems no more than a set of opinions from which any interest group can draw its ammunition. The media have become more polarised and less balanced. Although public and private researchers go through great efforts to communicate their results, the overall public feeling is that science rarely listens. The mouse with a human ear on its back has become the symbol of arrogance. In the worst cases science has lost its credibility altogether. Scientific literacy, even among politicians, government officials and journalists, is the exception rather than the rule. Let me remain silent on the poor use of statistics: anecdotes or

correlations presented as causality.

The fact that sometimes scientists disagree publicly, as in the case of climate, does not help public perception either, although the core of science is exactly that: open questioning and verification. Science cannot confirm commonly held opinions or produce simple policy solutions that please the majority. Science can only try to remain independent even if that leads to unpopularity. Besides, what are desirable solutions? Nobody has asked explicitly for intensive poultry schemes, but most consumers do opt for low cost chicken meat, showing that behaviour and words do not always coincide.

But we cannot ignore the profound public desire to see scientific institutions and companies respond to legitimate questions such as: what is healthy food? what is safe? how ethical is our reliance on animal proteins? is there enough water? how much energy can come from biomass? is biodiversity really essential to our survival?

And yet. The most revolutionary innovation of our times has not been something anyone asked for or could imagine. The internet and smart phones are the proof of technology-driven unsolicited innovation, the best example of successful technology push.

Communication technology now complements the earlier agricultural and fossil fuel revolutions. Over six billion people possess mobile phones. We will become even more permanently connected, to other human beings and objects. The internet allows nearly every citizen to have access at all available information. But most will be unfiltered information, seldom tested and rarely peer reviewed. Artificially intelligent technology cannot replace human thinking. Our challenge will not be to develop scientific and technological information for further material progress. It will be to find “embedded technology”, that fits societies and individuals in all their diversity.

This constitutes the New Enlightenment of our times: bridging the gap between the sciences and society, developing diverse embedded technology. A new Enlightenment is even more urgent now, when radical interpretations of religion and tradition may lead to extremism. Like the philosophers of the past centuries we need to

overcome misunderstandings and superstition. But we must not do this is the old way, by insisting on the validity of our methods or the truth of our data. Too often this only reinforces to unresolved controversies, e.g. about GMOs or dietary sugar. We must find a new way of engaging society in the development of knowledge. However, such engagement is not a matter of collecting masses of unfiltered individual opinions and deduct a common denominator. The fallacy that the citizen is only a consumer who is always right has been imported into the political sphere and the media. But consumers are not always right. Consumers easily express lazy desires: Swedish welfare on American tax rates, or, in our realm, cheap food from small farms where all the work is done by hand and animals play in flowering meadows. This is not to say that these are not genuine emotions. But individual preferences are different from those that people develop after a process of group deliberation. When politicians genuflect to public opinion, it is often to these superficial individual wishes, not to the outcomes of informed collective thinking. We need a platform for collective deliberations with local interest groups, small businesses as well as international agencies and multinationals. We may also involve consumers in research through citizen science, e.g. in collecting insects from wind shields. The case is simple: there cannot be impact without trust. Consensus may not always be possible, but delaying decisions seldom helps. Hence communication is not the end of technology development but its beginning.

Moreover, technology rarely presents a perfect solution to meet all needs. There is no progress without trade-offs between competing goals and desires and unexpected side-effects. Food has an environmental cost, just like urban development. Doing away with the toil of manual labour means mechanisation, but also job losses and soil compaction. Dialogue should aim at a socially acceptable balance. As a densely populated delta with a strong rural sector and extensive natural areas this country provides a prime example of how food production, sustainable metropolitan development, water management, alternative energy and healthy living combine. Why

not be bold and declare The Netherlands as a living laboratory for the world?

When it comes to impact, I see three types of knowledge. I will call them the green, orange and red lights from Wageningen, although they are complementary rather than separate.

Firstly, we need to apply and integrate existing knowledge, and harvest its value. This will make the greatest difference in the short term. I call this getting the green light. Many of the best practices for sustainable food production, nutrition and environmental management are known. They are not applied because of economic, legal or social barriers: it is still cheaper to pollute in the absence of laws that make the polluter pay, consumers throw out too much food, fertilizer is still applied excessively. Valorisation means building business cases, promoting entrepreneurship, and also contributing to national and international laws and policies. We will strengthen cross-sectoral synergies to develop a common focus between our science groups. Simultaneously, we will build on our DLO institutes, and our business support policy work, to cover the entire chain linking applied and fundamental research.

The second type of knowledge aims to enhance current understanding of technical and social processes. This involves systems biology at all scales, including the humanities: the role of carbohydrates in human nutrition, genetic fine-tuning between predators and hosts, seed conservation under anoxic conditions, dietary behaviour. Let me call this the orange light: we may go slowly on immediate impact, but there is great potential for useful applications. And urgency too: feeding nine billion people sustainably is not a matter of just applying what we know. Rather than pursuing only scientific goals, we must consider impacts and how they can be mitigated. Take robotics. It is now possible to plough and harvest land with unmanned machines, to milk cows at their wish and monitor their health without human interference. It lightens the job

for farmers. But the public reaction is likely to be negative, the wish to see food produced by a person rather than a machine is too strong. We have to accept this, and discuss other options, short and long term, to raise food production and improve working conditions.

The third type of knowledge is disruptive knowledge. The light is red here, either because society has great hesitations or because science is not ready. Nevertheless, we can predict that information technology will continue to be paradigm changing. Think of integrated personalised devices that accompany the elderly. Or smart phones for poor farmers to substitute for the market economy and health care. However, the IT revolution of which so many expect so much will only impact food, agriculture, environment and energy if fundamental research moves forward too. We need more room for bold serendipity. Crucial areas are genetics and photosynthesis. In fact, why is there no international consortium for enhancing the efficiency of our most precious biological process, photosynthesis, when billions are mobilised for the equally bold idea of nuclear fusion?

Dear students, education gets my bright green light because it is the most direct road to impact. Education is an evolving ecosystem. We have to strike a balance between training students here or on distant campuses or through online courses, between full time students and part time, and those who come for courses later in life. I would also love to see more action through international summer schools, more student research through involvement of DLO institutes and, because of the growing demand for graduates who couple scientific knowledge with entrepreneurship perhaps even an MBA in food chains.

The best education is not limited to science and business skills. You will become scientists, thinkers or doers who are sensitive to the societies you work in and the emotions your work arises. Well trained in your respective disciplines, yet able to bridge the double gap between Snow's two cultures, between science and the humanities

and between research and society. In Wageningen with its many nationalities you will interact with others from different cultural backgrounds. This helps you to help others to voice their needs and fears. As knowledge and methods continue to evolve in your life time, the most important thing for you to learn is how to learn. And please: read! Not just books about people like yourselves but about those far away in other times and places. Open your minds and train your brains!

Dear colleagues of DLO and the University,
We are asked to respond to grand societal questions – as the European research programme Horizon2020 calls them so eloquently. We all agree about the overall challenge for the future: the transition to a circular bio-based economy where all outputs, including waste and emissions, become inputs in new production processes, where ecosystems are protected and restored in order to contribute to well fed, healthy and sustainable societies and individuals. Notwithstanding lots of technical progress (e.g. recyclable biomaterials) the details of this overall transition are far from clear, and multiple trade-offs exist, between biofuel and food production and between different bio-based sources. Designing new technology alone is insufficient without social change. In some food chains two thirds of the greenhouse gas emissions occur at the household level, e.g. through cooking or refrigerating. More efficient resource use may lead to more consumption, unless consumers adapt their behaviour. So the challenge of the future is not just technological but also one of values and behaviour.

There remains one enormous issue: the gap with the bottom billion. Clearly, there cannot be sustainable development with rampant poverty, inequality and civil strife. The poor need to be connected to markets, to health care and education. We know that economic growth is a necessary, if not a sufficient condition to reduce poverty. Most of the poorest countries have sizeable rural populations: there economic development can only mean agricultural growth. Tackling unemployment through value-added entrepreneurship in food chains

is the way to provide a decent living to youngsters. More of them need to be trained as scientists too, in Africa in particular. The UN Sustainable Development Goals provide a new and hopefully useful framework which we are well placed to contribute to.

Our mandate is global, our science knows no borders. Yet we are still predominantly a Dutch organisation, in administration and culture, even if we teach mainly in English, and are proud of our foreign students and staff. Undeniably Dutch pragmatism has been part of our success. However, we need a greater diversity of minds and cultures and scientific views. An institution where the light shines in all colours. To attract and retain the greatest talents in the world we must make them feel at home, scientifically and personally.

Like food production, Wageningen UR has local roots and global reach. There can be no doubt about our international scope. The world needs our knowledge and our graduates. We will build even stronger networks, in developed and developing countries. We also want to join forces with our European, North American and Pacific colleagues. Some of the world's best science and most innovative companies are located there. Of course, working in a global environment entails risks of overstretching in countries where private and public sector governance may be deficient, so a cautious ethical stance is called for.

Dear alumni, ambassadors and partners,

I am grateful to you all, our many private and public partners, without whom we would not be this outstanding institution. Many of you generously provide long term commitment, financially and in kind. Our excellent record obliges us to work harder and think deeper. We must not fall into the 'innovator's dilemma', taking success for granted and changing too little, too late. We cannot count upon the easy acceptance of society. The golden triangle of government, society and science that has been our basis for so long, is starting to crumble. Even if the current Dutch government pays verbal tribute to the importance of innovation and allocates a modest percentage of resources, we have to recognize that the

reputation of science is far from perfect. There are also few people in The Hague who understand that food and agriculture forms not an economic sector like any other. At the same time, the current lack of trust and declining funding constitutes also a tremendous opportunity to renew our dialogue with you all.

It is an enormous privilege to serve an institution where so much talent and motivation are concentrated under a unique mandate that cannot be matched for relevance and urgency. I know you are here because like me you truly want to make a difference. Please join me in reshaping the relationship between science and society in food and agriculture, in building informed collective decision making. As a symbol of our multi-coloured New Enlightenment one of these lights will be presented to you all as a token of our appreciation.