Your Excellencies, Mr. Mayor, ladies and gentlemen, distinguished guests, dear colleagues, dear staff, dear students,

It is a great honour for me to welcome you today to this opening of the academic year 2016. Regretfully, I have to start with a rather disappointing announcement. Due to unforeseen family circumstances, our speaker for today, professor Juma from Harvard, is unable to make it. This is a pity. However, I did confer with professor Juma, whom I have known for a long time, and I will try to include some elements of his speech in mine. Juma's book is called *Innovation and Its Enemies*, and that was very much the reason we asked him to come, for today's theme is *Rethinking Innovation*. Of course the title *Innovation and Its Enemies* strongly echoes that other famous book written by Carl Popper some decades ago called *Open Society and Its Enemies.* How open are we, as societies, to innovation? And what exactly is innovation? Are there differences between how people, scientists, governments and the private sector deal with innovation? In this respect it is quite interesting to think back to about half a century ago, say the 1960s. Innovation, then called *modernisation*, was often associated with developing countries and areas, which were traditional, even primitive, with people living in Africa, Asia, Latin America, or in developing rural areas in the richer countries. There have been many studies on why populations, as it was considered in the language of that day, were so backward. What was it that made them reject innovation, that made them resist the good intentions of governments, educators and missionaries? Particularly in Africa and Latin America, many studies were conducted on why farmers, for example, refused to adopt modern farming methods, or why herdsmen, particularly in West Africa, refused to clear the bush, although it was very well documented that Tsetse flies causing *trypanosomiasis* (sleeping disease) were present in the vegetation. Even after many years of forest clearing and a notable decline in the incidence of Tsetse flies and sleeping sickness, the herdsmen, the Fulani in particular, said *'Oh no, we are not going to clear the bushes, we do it only because the government asks us to do so'*. There is an enormous body of colonial and post-colonial literature which documents this concept of resistance to innovation. Resistance is not just a matter of backwardness. The famous Dutch professor of Anthropology, Andre Köbben of Leiden University, wrote a seminal book in 1964 called *'From Primitive Man To Fellow Citizen'*. In that book he documented the many internal factors and external factors that explain the difference in willingness to adopt innovations. The internal factors concerned the hierarchy of the society, the means of production and so on, and the external factors dealt with how the innovation or the change was actually presented, how long the exposure was, and above all, whether it was indeed useful in an immediate sense to the people concerned. However, when one looks closely at those factors, you see how difficult it becomes. One interesting example is the difference between the Igbo, the tribe from Biafra and the rest of Nigeria. The Igbo had a system whereby young men were not allowed to inherit from their fathers. The land was therefore undivided, and that meant that an entire generation of young men flocked to the cities because they had no other means of existence. You might think that those young men would be more open to adopting innovation and that those who remained in the village would remain as traditional' as many other tribes around. However, that was

not the case. In fact, the entire Igbo population was far more progressive than the rest of Nigeria. And that was indeed so, because those young men who migrated to the cities kept in close touch with their tribe, their families and their villages. There is an interesting corollary here with respect to migration as we know it today. The communities that fit best into their new countries are the ones that keep their identity but do not live in isolation, the ones who do not live solely as they did their own countries, and those who have the chance of a job, the opportunity to integrate fully, who are assured education, or who integrate successfully through some other means. And so it is the balance of interaction between a traditional community or family and modernisation and new influences that explains why some people are better at assimilation. When we look, for example, at the waves of immigration into the United States in the 19th and early 20th centuries, we see how this plays out at an individual level. Put differently, innovation is about individual characteristics as well as about the society as a whole, and about the kinds of characteristics that innovation itself represents.

Now the irony today, of course, is that it is not the underdeveloped rural areas in Africa, Asia and Latin America that display the symptoms of resistance to innovation. No. Interestingly enough, some of the most conservative elements are found in the urban centres particularly in the middle classes, especially in Europe and the United States. Our fields of work - food, agriculture, and environment - are, in that respect, a case in point. Concern, sometimes evolving into conservatism, is growing among the middle classes. Perhaps this is the case because they have something to lose, but attitudes towards food and technology - think about meat, think about genetic modification – promote outspoken views on which innovations are wrong or bad, and which are right or good.

In the discussion about the advancement of science, government policy is always viewed as a moral issue. It is about either/or, good or bad, black or white. It is about dichotomies, about not creating middle ground or nuances. Resistance to innovation means not tolerating ambiguity. And perhaps in a society that is changing rapidly, ambiguity is indeed frightening. But the result is that many people, particularly those who are wary of innovation, think in terms of moral dichotomies. Furthermore, many concepts that are part and parcel of science are loaded with a negative meaning - efficiency, intensification, industrial, genetics, processing. Or the opposite- natural, green, biological, artisanal – have positive associations. Dichotomies make it difficult to engage in dialogue. In industry too, dichotomies emerge, think of the decades of debate about butter and margarine, for example. In this case, one bright moment of innovation emerged when suddenly somebody thought *'Well why not mix the two?'*, and we now have some buttery margarines that may contain the best of both worlds. But it is, of course, only rarely possible to mix two innovations in this way.

Dichotomies such as industrial versus traditional do not stand up to scientific scrutiny. Moreover, people harbour ideas that they often don't put into practice. If you ask an average family in the Netherlands or in Europe, whether they are worried about climate change, they are, but very few people want to mitigate climate change through a windmill in their backyard, nor do they like the view of windmills in their neighbourhood. Nor do they want to insulate their houses unless they're offered a subsidy. So we're quite capable, in fact, of harbouring such inconsistencies. Dichotomies persist despite overwhelming evidence that in the past, food was far more easily spoilt, it was more fibrous, it had fewer nutrients, crops were difficult to harvest, it involved a lot of work,

there was high spoilage, and serious food safety risks etc. Rational arguments do not help and make people feel more strongly that science is biased and scientists are unwilling to listen. It is easy to boast about the successes of, say, microbiology, but still fail to convince the public. The tragedy of our times – and I do not use this term lightly - is that innovation may not progress enough due to the fear of change.

Of course, in a way, the public has a point. Those who are concerned, or nostalgic, or don't like efficient food production, are correct in feeling that something has been lost. Something of the old ways of life, the idea of a community, the idea of belonging somewhere, the idea that there was no anonymity in the food chain, that there was a sense of responsibility for others and the -environment. Most likely this was not the true reality, but this is how many now see the past. These features risk being lost in a globalised economy, in a globalised Europe.

The irony is that in the emerging economies and even many of the poorer economies, the attitude is the complete opposite of what it was 50 years ago and of what we now see in affluent classes. In many so-called developing countries the view is that engineering, for example, is a good thing; engineers bring solutions, and hence development really needs to be science-based. Where the memory of poverty is only a generation away, the advancement science can bring is desirable. Hence these countries put a far stronger emphasis on investment in education, science and engineering than Europe and the Netherlands.

The resistance to innovation is a function of belief systems. That was true for the Hausa, or the Fulani herdsmen, and it is true today. In an era of social media, multiplying opinions at high speed, individualisation of opinions develops rapidly. The framework for news stories nowadays is no longer an objective story about a new finding. No, it is quite often a personal story by an individual, a journey that a journalist takes by asking people about their personal experiences. The subjective becomes the norm, and not the objective or the statistical. Personal correlations out of the context of demographic statistics abound. The individualisation of resistance to innovation and attitudes towards science is blurring the difference between science, news, the media, and entertainment. If science is attractive in the media nowadays, it is mainly through entertainment, especially on television. "Liking" stories on the Internet has replaced other ways of forming an opinion through books or newspapers. No scientific authority counts, because your own opinion is as good as mine, and probably better because it's yours. As a result we live in a time when not facts but opinions, emotions, and what I would call factoids, random bits and pieces of information, rule the day. We're no longer in an era in which information or data lead to a consolidated view. No, we are in an era of selective shopping, not even for facts, but for data.

I can only repeat what I said a couple of years ago, here, in my first speech: everybody has the right to their own opinion and emotions, but you don't have the right to your own facts. However, I have been proven wrong. In today's age of social media, you also have the right to your own facts, and you have the right to go shopping selectively for your facts. And that, ladies and gentlemen, actually degrades science to just a collection of individual opinions. This is a serious matter because all of us, you and me included, suffer from something called a *confirmation bias*. We selectively look at elements that confirm what we already feel or think, or how something should be. We look for something that confirms our moral stance. And confirmation bias, whether it's in science, in government or in the private sector, is one of the most difficult things to eradicate because we are hardly aware of it. So science is not only considered just a collection of facts, or just a

supermarket where the government or an NGO puts in a few euros and a few euros of value come out. No, it's even worse. We are considered, and I'm not exaggerating, to form a conspiracy, to keep people in the dark, we are seen as selling ourselves to the private sector, governments or to all kinds of obscure forces.

Can we do something about it? Indeed, we need to undertake a couple of things to get this corrected. It's not going to be easy, it's not going to be short term, but I think the first thing for us to be aware of in this situation is that although some groups feel more negatively about science, they still believe, in some small way, in science. In fact, they go shopping for facts and for research, so the idea that there *is* something in science must not completely be discarded. Even for those who put their trust in alternative knowledge it's still science that they look for.

Hence, firstly, we need to find common ground with the sceptical and confused public on the methodology of science; the idea that science is there to test, to validate a hypothesis. Secondly, people do not believe facts, they believe other people. In this day and age, when individual lives become public on the Internet, we need to communicate at that individual level. So this is *our* task. Let us find among us those students and staff who are charismatic enough, who can carry emotion, and yet also be carriers of the validity of science. Most of us are not trained adequately to seek that kind of media exposure. Thirdly, we need to consider creating incubators. Not business incubators, but something larger: social incubators that actually go beyond the technical innovations to explore the social context. Let's create some safe spaces, maybe some kind of dialogue space, where we can discuss some of the ways in which science could advance. There are a number of urgent subjects we are working on that most of society still has no clear idea about, or is reticent. Think of nanotechnology, robotics, latest breeding technology such as CRISPR/Cas, synthetic biology, all those terms which in themselves may provoke fear. Let's create safe spaces for trial and debate, for example, about nanotechnology and its advantages, and associated problems. A balanced debate would aim for *plausible benefits*. In other words, we don't know everything, we cannot promise only benefits but some results are plausible, likely to happen. Too often, in equal measures due to financial constraints and a desire to serve society, science has promised too much too quickly. Talking about plausible outcomes, plausible benefits inspires more trust.

In our field of food, agriculture, and environment we can learn something from other disciplines and other sectors of society. Let me name a few. First of all, there is the medical sector. What the medical sector has done very well is to create patient organisations in which patients have a long-term association with science, such as groups based around certain forms of cancer or neurological diseases. Scientists and patients are really conducting a dialogue. Let's see what we can learn from the medical sector. Similarly, we could learn from a very different sector, the tourism sector. Why are the most successful innovations of today, Airbnb, Uber, sites like Booking.com, so successful? It's not only because we have more money and more people want to travel. No. The key is that they have a system of rating which actually gives direct feedback to offer and demand. Maybe we can think about our innovations and find rating systems that are appropriate, finding ways of communicating from individual to individual. Technology, smart phones and sensors will help. We could use these to foster participation. We're not yet into a participatory mode, and that's very logical because we are, in a way, a supply-oriented organisation. However, I believe firmly that the move towards a continuous dialogue, based on consumer organisations and feedback, will help us forward.

Creating these safe incubator spaces can be part of that. We are making progress in the last ten years in *citizen science*. This implies not just creating listening spaces, but actively involving people in science. We've done that in entomology and ecology work, but we can probably improve this. Do it in an even better way. Food is a great subject. There are apparently about 4 billion recipes on the Internet, which could be mined to understand changing dietary patterns. Creating an active community around dialogue centres on the Internet, may be a way to move forward.

The Netherlands is world-famous for its Golden Triangle, the combination of government policy, science and private business including farming. However, as resistance to innovation is taking hold in some quarters, think of genetic modification and robotisation, we need to reconsider this triangle. We must build a much a stronger link with the civil society. We need to communicate more with NGOs, with consumer and patient groups perhaps. That means reinventing the Golden Triangle in a different way, because the communication between the private sector, government, and science is relatively easy compared to the diversity of civil society groups.

Another point that we need to reconsider is the issue of risk. Most people today demand a zero risk society. However, when it comes to personal risks, they do not mind getting into cars, going skiing, doing all kinds of things that are inherently risky. Risk is considered the domain of others, others cause traffic risk, not the individual. Risk in the scientific sense of *impact x probability,* is something that we need to address in the context of innovation. Does the outcome justify the risk or not, and under what conditions? I think that would be a very useful debate. Last but not least, when we talk about building communities, we need to build long-term commitment to who we are as an institution. In that respect we can learn something from the cultural sector. No museum, no orchestra, no theatre exists today without having a " friends of" the theatre or the orchestra. Beyond our ambassadors and beyond our alumni we may think of creating a "friends of" group for Wageningen, a group that will think with us about these ways of communicating, of building that commitment on the longer term.

Finally, the scientific and societal challenges we are working on are still as relevant, as urgent as they were a couple of years ago. But the context has not become easier, but more complicated. We must find new solutions to old problems, and new solutions to new problems that we don't even know. Our intellectual honesty and independence are to be protected at all times. In which yes, there is room for emotion, there is room for personal freedom, but in which we also have to protect the very fragile architecture of science. Because unfortunately science is messy, science is difficult, science goes through roundabout ways, science doesn't always get the solution in one go, and it's very often counterintuitive. That's why science must be about what we call *suspended judgment*. About the openness of mind to say *'I don't know yet',. Suspended judgment* is the opposite of *confirmation bias.* We must repeat this again and again. Science is not about collecting factoids, it's not about collecting opinions. It's about building a messy complex architecture, the only organised way to work towards validating or falsifying our doubts. We have nothing else. Resistance to innovation often feeds on intuition, while science is counterintuitive, and hence is not easily accepted. Think of how we see the skies, the moon and the sun moving across the skies, yet it took us millennia to understand that what we see is not how it works, the sun is not revolving around the earth. So let's find ways to explain and communicate about counter-intuition.

Right at the heart of this discussion are our students. The need for a permanent dialogue has important consequences for the way we organise our education. We must teach not just a discipline, but also how to deal with ambiguity, with the counterintuitive, with the nature of science, the difference between facts and factoids. Science and innovation move forward in a haphazard way, and hence those who are doubtful about innovation may also have a message that students need to learn to decipher. If you cannot deal with ambiguity, if you cannot deal with dialogue, you cannot really be a science-based citizen who serves the world. In Europe, or further afield, it would be such a tragedy if the advancement of science was stopped for the wrong reasons. The irony today is that our best friends in this endeavour are indeed in the countries that used to be called *backwards*. Some of the most exciting things are happening outside of Europe, whilst we tend to be conservative and frightened, and even populist at times. We need to look beyond the now, and towards the enormous potential we have as a scientific institution, but also as the continent where science has ultimately proven to be so very useful. The point that Juma made is that innovation also has to involve social inclusion. He points out that the reason why people do not accept innovation is often the fear of being excluded, the fear that changes are going to be too rapid, fear of the unknown. And don't we all have that? Don't we all feel that we sometimes don't know where the world is going. We cannot look even 20 years into the future and know for certain what's going to happen. But it's our endeavour to be open-minded, to communicate and to move forward from this fragile but fantastic architecture we call science.