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Nestlé's war on waste: a journey through the supply chain

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ABSTRACT: Nestlé celebrates its 150th anniversary in 2016. Behind such a long history, questions of sustainability and protecting the future have always been key. With increasing water scarcity, constrained natural resources and declining biodiversity, we need to protect the future by making the right choices. We focus on continuous improvement in our environmental performance everywhere we operate, to provide products that are not only tastier and healthier but that also are better for the environment along their entire value chain. Our goal is to send zero waste to landfill from our factories globally by 2020. Over the last ten years, our focus on reducing waste for disposal has seen waste reduce by 75%, with one in five factories now generating no waste. However, we also consider waste more holistically, looking at all steps from agriculture and ingredient production, to the factory, in the supply chain and through to the consumer's home. This approach requires detailed target setting as well as an in-depth understanding of behaviours and systems in different countries, both those that lead to waste, and systems that manage waste. In addition, Nestlé is focusing strongly on reducing food loss and waste, both upstream in agriculture and through to the retailer and consumer. This is a crucial part of the journey to feed a growing global population and contribute to meeting the target of the Sustainable Development Goals to halve per capita global food waste by 2030. With 436 factories in 85 countries making products sold in 189 countries, the company aims to improve resource efficiency, quality and productivity in our operations to do more with fewer resources and less waste. The story of Nestlé's approach to waste and recovery is one of both high-level commitment and deeply detailed activity, supported by external collaboration. This reflects the breadth and complexity of its operations. This paper presents broader industry trends with respect to waste, and why this fits in with broader corporate social responsibility and sustainability issues for companies in general, while giving specific Nestlé examples.

Keywords: food losses, food waste, supermarkets

This year, Nestlé is celebrating its 150th birthday. Milestones are a time for reflection – what got us here; what made us who we are; where next? In Nestlé, we ask the same questions: How did we get here? What will take us to another 150 years? How do we protect the future? What are the right choices, now, that will give us genuine sustainability?

Nestlé is a significant business by any scale (Figure 1). The mindset that we bring to our environmental performance is more important than ever. Today,

This is the paper and some of the illustrations that Daniel Lagger presented at the conference.

Figure 1. Nestlé is a significant worldwide business that has been operating now for 150 years.

we confront issues of increasing water scarcity, constrained natural resources, declining biodiversity, and climate change, so the importance of making the right choices could not be more clear. How we think about waste is obviously a key part of this.

Of course, reducing waste should be a no-brainer for every business. Waste has a cost. Waste is things we have purchased or created that have cost us time, money and other resources. To not use them is to have invested resources in something with no return. That makes no sense. This is something the entire food and beverage industry knows.

However, it is not enough to simply say we want to reduce waste. Rather, we have to take an end-to-end look at our supply chain, upstream to basic research and agriculture and right through to the retailer and on to the consumer (Figure 2). We need to deeply understand what waste looks like, how it comes about, and how we can do better. This takes both an eye for detail, and creative thinking.

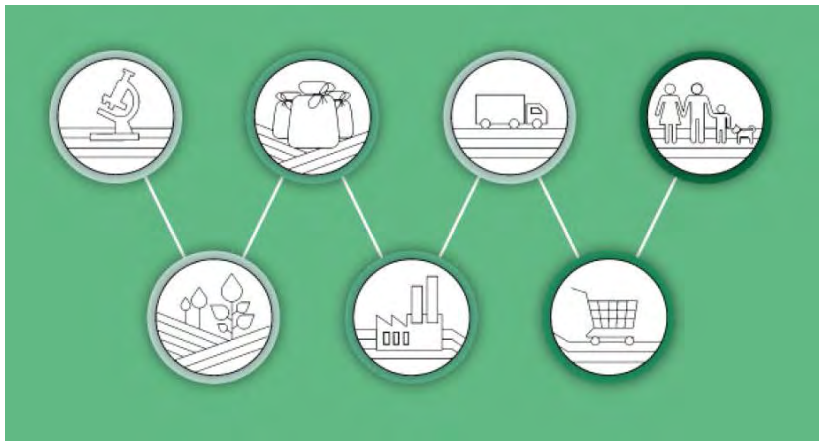

Figure 2. Planning for no waste: set targets, measure, constantly review.

In a world facing increasing constraints on natural resources, Nestlé has set this simple but ambitious long-term goal: zero waste for disposal. We are making progress against a number of interim targets by preventing and minimising the waste we generate in the first place, by avoiding food wastage and improving resource efficiency along the value chain, and where possible we try to reuse materials and create value from them. It is not one project but hundreds, even thousands, across Nestlé's 436 factories, and out to the ends of our supply chain.

Nestlé thinking globally

According to the Food and Agriculture Organization of the United Nations (FAO), about one-third of global food production is wasted worldwide each year (Figure 3). Either perfectly edible food is thrown in the bin, or food is lost when it spills, spoils, bruises or wilts before it reaches the consumer.

In an age where 800 million people go hungry, the significance of that waste is extraordinary; the challenge for our industry no less so.

Food waste causes 8% of human-produced greenhouse gas emissions. If it was a country, this wasted food would be the world's third highest emitter of greenhouse gases, behind China and USA, and the water needed to grow this food would fill Sydney Harbour 475 times.

The United Nations' 2030 Sustainable Development Goals acknowledge the seriousness of this problem. We particularly note Goal 12.3:

> 'By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses.'

In response, in January 2016, our CEO Paul Bulcke joined a new coalition, Champions 12.3, to accelerate progress towards fulfilling this goal. Subsequently, we, together with our peers in the Consumer Goods Forum – a coalition of more than 400 of the world's largest manufacturers, retailers and service providers – resolved that forum members should halve food waste from their own operations by 2025.

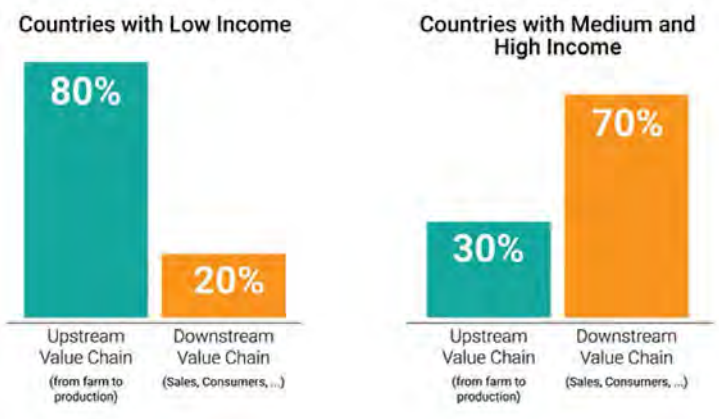

Figure 3. Worldwide, food waste is an issue: resources invested for no return.

One major hurdle to progress for both industry and government has been a lack of consistent guidance on how to reduce food waste. For that reason, Nestlé, as a company already measuring food waste, played a key role in developing the first global standard to help companies and governments reduce food loss and waste (see also Lipinski, this voume). Members of this partnership include the Consumer Goods Forum, the FAO and the World Resources Institute.

This standard, the *Food Loss and Waste Accounting and Reporting Standard* (FLW Protocol 2016), was launched in June at the 3GF Global Green Growth Forum in Copenhagen. It provides the first-ever set of global definitions and reporting requirements for companies, countries and others to consistently and credibly measure, report on and manage food loss and waste. It has been hailed as a real breakthrough because, for the first time, countries and companies will be able to quantify how much food is lost and wasted and where it occurs. Not only can they then report on it credibly and consistently, but identifying hotspots will be the first step towards developing new strategies and monitoring progress.

This serious problem will require a great deal of focus at global and local levels, and for this reason, we are actively involved in a number of other multi-stakeholder initiatives to reduce food loss and waste.

Nestlé acting locally

Internally, Nestlé's Zero Food Wastage Taskforce coordinates our efforts to drive our food wastage initiatives across our value chain, share good practice and guide multi-stakeholder initiatives. Last year, this Taskforce launched our commitment to reduce food loss and waste, which addresses food loss and waste through responsible sourcing, zero waste for disposal in our sites, educating consumers and employees on reducing food waste, and engaging with key stakeholders – such as regulators and scientists – to develop and implement solutions.

Worldwide, 54% of this lost and wasted food comes from the upstream value chain – in production, handling, post-harvesting, and storage – and 46% comes from the downstream – in transformation, distribution and at consumption. In developing countries, this skews more strongly towards production at the farm. These are also the countries where hunger is more likely to be a concern.

At the farm

As a buyer of raw materials grown by more than 4,000,000 farmers, and with direct buying relationships with 760,000 farmers, we have an extraordinary capacity to support change. We can help reduce on-farm losses by helping farmers to farm more productively. For instance:

- in Vietnam, by helping coffee farmers to use the right amount of water – not too much, not too little, and to water at the right time to maximise their productivity without wasting water;
- in the Ivory Coast, by training cocoa farmers to harvest cocoa pods and ferment and dry the cocoa in a way that preserves the cocoa and keeps the quality high – while teaching them to compost the waste for the future of their trees;

- and in farming globally, by continuing to contribute to farm capacity-building – from propagation to post-harvest storage, farm animal health, care and welfare, breeding better plants more fit for purpose, farm management and record keeping, and water conservation, irrigation and soil fertility.

By contributing to the efficiency of their farms and a path to market, not only do we help secure supplies of the agricultural raw materials we need, but we also positively impact society by supporting rural development, water conservation and food security and reducing food waste and farm losses at that critical stage.

Storage, handling and transport

As food moves from the farm towards the factory, food companies are able to help farmers decrease post-harvesting food loss.

To do this, Nestlé has created a new initiative called Vital First Mile, which brings our colleagues with experience and expertise in transportation and storage to Nestlé teams around the work to optimise that First Mile and minimise losses between the farm gate and the factory gate.

Reducing these post-harvest losses in our upstream value chain helps us ensure supply of agricultural raw materials, and also supports rural development, water conservation, and food security. For our suppliers, the Vital First Mile initiative will help farmers, raw material pre-processing suppliers and logistics providers to reduce post-harvest and storage losses and thereby save costs.

Our first Vital First Mile project in Qingdao, China, enabled Nestlé to successfully transform dairy farming operations to dramatically decrease milk loss. Having collected milk in the area for 20 years, Nestlé decided to transform its model with a streamlined approach to milk collection which would reduce milk loss and collection costs while increasing quality and improving dairy farming sustainability. Nestlé provided financial support to help farmers buy equipment to improve cow productivity and milk quality and decrease waste milk production, then backed this up with regular training and technical support for farmers on topics such as reducing milk loss and improving quality.

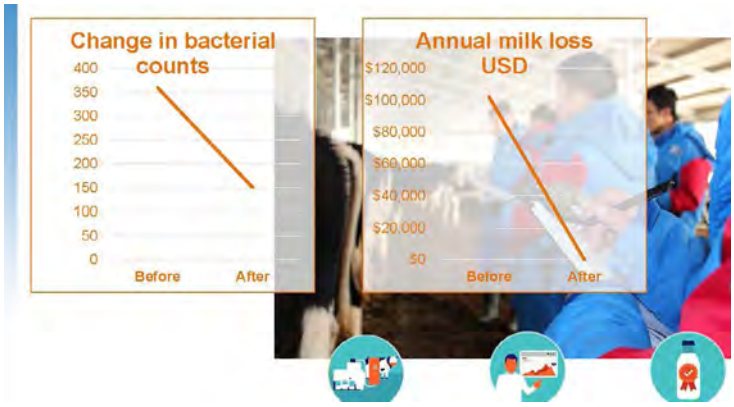

Figure 4. Better milk quality and less annual loss resulting from the Vital First Mile project at Qingdao, China.

The outcomes have been significant. Bacteria counts in milk have dropped by over 50%, and the amount of milk lost to poor quality or because of antibiotic use has gone from US$102,000 worth of milk to no loss at all (Figure 4).

This is a new project for us, but early signs are promising.

In the factory

Clearly, the part of the supply chain at which food companies have most control over waste is in our own factories. Nestlé has set itself the objective of zero waste for disposal across all our 436 factories by 2020, across all forms of waste. Waste for disposal is any material that leaves our factory for final disposal with no economic or ecological value such as landfilling and incineration without energy recovery (Figure 5).

We are well on the way: by the end of last year, 105 factories – that is 22% – had achieved zero waste for disposal.

Using best practice from those factories, we have developed a Zero Waste for Disposal Guideline. We recognise that every factory is different, every factory has different forms of waste and different challenges, and every location has different waste management opportunities. This guideline helps each site to understand the challenge they may face in their journey towards zero waste for disposal; discover the recycling, recovery and reuse destinations of different materials such as coffee grounds, tea leaves and coffee capsules; compare economic costs and benefits of achieving zero waste for disposal; and share tools and examples of best practice implemented across the company globally to help all our sites prevent, reuse and recover waste for disposal and by-products. As a result, every Nestlé factory has projects to reduce waste, with the goal of zero in mind.

As manager of 12 very different factories across three countries, with many forms of waste, I can confidently say that there is no one-size-fits-all approach. But I am impressed by the power that setting a hard target can have on the

Figure 5. Nestlé's objective is zero waste for disposal from all 436 factories by 2020.

capacity of a factory team to grapple in a meaningful way with the waste generated within a factory.

A few local examples will give a sense of the diversity of both the problem and the solutions.

- At our factory in Gympie, Queensland, which makes instant coffee, spent coffee grounds go into a biomass boiler – providing 65% of the energy used at that factory. Not only is it an effective way to use waste, but it has reduced carbon emissions, disposal to landfill, and meant significant cost savings. The same model is used today in 22 Nescafé factories worldwide.
- At the Uncle Tobys snacks and cereals factory on the Murray River between NSW and Victoria, setting a challenging goal led to 46% reductions of waste for disposal, and a further 44% in successive years; the range of approaches include recovering by-products, recycling, and selling oat hulls as animal feed.

I am also inspired by what can happen when people become genuinely engaged with the problem.

- At our Blacktown factory in western Sydney, we worked with the TAFE (technical college) to provide training for staff to encourage them to grapple with the problem of waste. Engagement was so high that our factory workers were using their own personal time to make contact with businesses and local government to try and find better paths for the factory's waste. This very motivated and fired-up group has not only transformed waste at this factory but also the project to manage waste has refired the factory's entire culture.
- At our Milo factory, at Smithtown on the NSW mid-north coast, we are actually using waste from another industry! We take sawdust from the local timber industry and use it as an energy source. As a result, 85% of the energy we use in that factory is not only from a renewable source but is part of ensuring another industry has a stream for its waste. But why stop there? The resulting ash from the biomass boiler then goes to a gardening company for composting.

Chocolate to biogas

There are a dizzying array of innovative different approaches outside Oceania as well. For example, in the UK we have developed an anaerobic digestion system at a confectionery factory which turns confectionery waste into renewable energy and clean water.

Essentially, a 'chocolate soup' of waste is fed into an airtight tank, where bacteria break it down. The biogas that is a by-product of this process produces enough heat and power to meet about 10% of the site's energy needs. While the technique has been used in agriculture and industry for centuries, what makes this factory's process unusual is that it has been designed to handle a high volume of solid and liquid waste within a short time. The system is converting about 4 tonnes of solid waste and 200,000 litres of liquid waste every day. It is also improving the quality of water discharged from the factory so that it is now virtually clean on release from the site.

While the system was expensive to set up, the reduction in the waste-disposal costs and energy bills means it should pay for itself in four years.

There are some challenges we have not solved – particularly in locations around the world where the infrastructure to manage waste is not sufficiently developed. Nonetheless, having met some targets already, we remain committed to our 2020 goal.

Transport and supply

Food and beverage companies have further opportunities to manage and reduce waste as we look beyond the factory gates to the downstream supply chain that takes finished products to warehouses and retailers before consumers buy it.

In Nestlé, we need to be sure that our trucks are fit for purpose. For example, we have purpose-designed trucks (Figure 6) to carry breakfast cereals which are large volume and lightweight. Cereal boxes have different needs to, say, glass jars of Nescafé. Clearly, a truck that is not full is wasting fuel and resources. We plan truck movements to ensure trucks are fully loaded, and partner with others to make sure we are not moving empty trucks. For example, working with CHEP we have redesigned our trucking so that after offloading our products the empty truck is loaded with CHEP pallets to bring to the factory. It is a cost effective arrangement for us both, which has saved 20,000 litres of fuel in a year and significantly reduced the kilometres travelled and greenhouse gases emitted.

We have even found a home for excess pallets by partnering with a charity which uses our excess pallets to transport donations to those in need. Last year, that was 4000 pallets.

We also have systems in place to give unsold food a second chance. In Australia, Nestlé and many other companies donate this food to Foodbank (a not-for-profit food-relief organisation). Foodbank has developed an efficient model to distribute this food to people who need it, via a network of charities around rural and urban Australia. We are told that the food is taken up as soon as it reaches the Foodbank warehouse!

Figure 6. Nestlé has purpose-designed trucks, including those that carry breakfast cereals which are large volume and lightweight.

In packaging

Packaging of food and beverages is crucial to prevent food waste, guarantee quality and make sure consumers are informed about what they have bought. For the food and beverage industry, improving how we design our packaging, the materials we use and the impact on the environment can make an important contribution to environmental performance across the product lifecycle.

The 'dream package' needs to:

- ensure food is safe from bacterial contamination;
- keep food fresh and present it well;
- use as little material as possible, with minimal environmental impact in making the packaging itself;
- run smoothly through machinery in a factory;
- be readily printable, so consumers can read the labels, and so it is easy to add batch and date codes;
- be low in weight, and maximise the amount of product that can be packed on a pallet – affecting the efficiency of transport;
- be made of recycled materials;
- be recyclable or, if that is not possible, add as little as possible to landfill.

And finally,

- consumers have to like it.

I wish all this were possible! However, the length of this list highlights that packaging must have sound science behind it in order for proper evaluations to be made of a package's true impact, and the right choices made. For that reason, since 2007, every pack we have designed has gone through a rigorous lifecycle assessment program.

Figure 7. In Nestlé, we assess the overall environmental performance of our packaging, and set targets to measure and minimise its use.

We can now assess the overall environmental performance of packaging from component sourcing to consumer use and disposal. This is critical for making good choices, and for improving. We also set targets to measure how much packing we can avoid (Figure 7). Industry collaborations such as the Australian Packaging Covenant help improve packaging across industry as a whole.

Here is one example to show you the difference this detailed approach makes. In the last two years in Oceania, we increased sales of our 'KitKat' chocolate bar but reduced the total packaging we used by 138 tonnes. As this packaging is not recyclable, that meant 138 tonnes less to landfill.

We also support initiatives to recycle or recover energy from used packaging. For instance, we have a partnership with TerraCycle who have developed recycling streams for Nescafé Dolce Gusto and Nespresso capsules.

Waste in retail and in homes

I started out by saying that food waste in the developing world happens in agriculture. In the developed world food waste happens much closer to the consumer: in the retail environment, in food service, and in the home.

Let me encourage you to look in a different way at the role of a company in the packaged food and beverage business. The very nature of what we do – that is, taking perishable ingredients such as milk, coffee beans and cocoa and transforming them into safe value-added food products with a better shelf life – means that we have increased the likelihood the food will be consumed before it goes bad. We have reduced the likelihood of food loss. For example, more than 75 years ago we invented a way to use up food that was going to go to waste: namely, an oversupply of coffee beans sitting unsold in warehouses in Brazil. Ironically, that product, Nescafé, is now one of our biggest global brands.

We also design packaging so it can help reduce waste at the consumer's home. For example, we put thought into portion sizes, so that consumers are more likely to eat the whole contents of a package, rather than using some and throwing out the rest.

It's an endless war

There is no single silver bullet for waste. Good waste-reduction starts with drive from the top, plus extensive external collaboration, plus an eye for opportunities that can enable thousands of small and large projects to eliminate, reduce, reuse and recycle. We couple all that with a focus on measuring and tracking – and long-term goals.

Although we face a world with so much food waste and loss, we can turn that tide through ongoing collaboration and commitment.

Those who measure waste can better manage it; those who commit to a path can effect true change.

That is good news for people, business and the planet.

References

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Daniel Lagger has been in his role as Executive Director, Technical & Production (formerly Operations), since 1 March, 2016. In the preceding three and a half years he was Technical Manager at Nestlé Japan. Daniel began his Nestlé career in 1984 as a Project Engineer in Switzerland. Throughout his 32-year career, Daniel has held different positions in the group, in the Philippines, Thailand and Switzerland. He holds a Masters degree in Mechanical Engineering from the EPFL (École Polytechnique Fédérale de Lausanne) in Lausanne, Switzerland. Daniel believes that the most important part of any role is working as one team to deliver results. Outside of work, Daniel likes sailing, diving and skiing, and discovering new countries.

Panel discussion

with Professor Louise Fresco, Dr Karen Brooks, Daniel Lagger

Chair: Dr Daniel Walker

The panel for this final discussion session comprises today's two keynote speakers – Dr Karen Brooks and Mr Daniel Lagger – and Professor Louise Fresco who presented the Sir John Crawford Memorial Address, 'The Future of Our Food', during dinner yesterday evening. In her address, Professor Fresco gave us an incredibly lucid and accessible account of the global food system. She ended it with a plea for developing a much deeper integration in science, policy and practice between agriculture, food, health and the environment. She asks us to see them as a single system, and to manage them as a single system.

Dr Karen Brooks this morning reminded us that food loss and waste are the outcomes of many millions of personal optimisation decisions and business optimisation decisions. And Daniel Lagger has just given us an overview of the numerous ways in which Nestlé has taken on the responsibility of managing its own processes and products to eliminate waste, and of helping other companies to do so as well.

Now I shall take the chairman's prerogative and ask the opening question.

Q – Daniel Walker, Chair
The Crawford Fund is here to promote and support agricultural research designed to benefit developing countries. How well is the global R&D system set up to address the types of challenges we are tackling, the challenges that have been talked about today, as compared to some of those more directly related to productivity? From your collective experience – in research, in policy, through the FAO and the World Bank, and in the commercial sector – do you have comments around how the global R&D system and innovation system might need to change in the next few decades to address some of these challenges?

A – Louise Fresco
Well I think actually we are much better off today than if you had asked that question five years ago. I think there is a real understanding now in the R&D community that waste is an issue, and it draws people together from a broad range of disciplines. From chemistry, food engineering, toxicology, defence, the economists and so on. I think we are much better off than before with microbiologists. However, we do not have a real vehicle, or a real mechanism, so what you see is some ad hoc programs, transversal programs that bring people together. Certainly at Wageningen we have a program on food waste, and I am one of those Champions 12.3, helping to raise the awareness that is dawning upon CEOs at the level of the World Economic Forum.

But the R&D system is still very much disciplinary, as I think we all agree. So the question is, should we also in our curricula, in the way we train our students, in the way we fund research, get a much stronger message to scientists that

This is an edited transcript of this Q&A session at the conference.

this is really an area in which it is worth investing? I think that understanding is growing, but we are certainly not yet there.

A – Karen Brooks
I would like to respond from the perspective of the CGIAR system, where I am presently located. I have been impressed with the discussion today, and I am coming away with a more profound understanding of what the circular economy means in this issue of managing food waste and loss. I think it is very difficult to separate the productivity part of that from everything else that comes next: from the processing part, from the consumption part, and even from the waste management part, which then feeds back into the production part. It genuinely is circular.

I think that we within the CGIAR system are coming to grips with an understanding of that. Our programs are designed to take a systems approach. We are not as active in the waste management side, although actually IWMI (International Water Management Institute) is working on municipal water management. I think we are proactive in certain parts of waste management, but we are still groping a bit to see where our best contribution is. Historically we have been strongest on the more narrow understanding of productivity, but within IFPRI (International Food Policy Research Institute), the institute that I am involved in now, we are certainly looking at the policy dimensions of food waste and loss 'across the board', and we are partnering with the FAO to develop a technical platform for measuring food waste and loss. So we are definitely getting involved. I can say that we are part of the process of building better understanding and working together for solutions.

A – Daniel Lagger
Maybe I can add just one thing. In industry, we used to work too often in 'silos'. We were saying 'OK, we know what we are producing; we are the experts', and so on. In today's world we see that we need to work much more together, between all organisations, all stakeholders, and understanding the positions of other people, not only our own points of view. I think in this we have improved drastically over the last few years.

A – Louise Fresco
If I may add, one of the issues still is that there is very little private sector funding to the public sector in a kind of private–public partnership to tackle these issues. There are a lot of wonderful statements, but there is rather little money going there. And I do also want to repeat my plea for deeper integration in science, policy and practice between agriculture, food, health and the environment. I think we have to reflect this in the curriculum where we are starting to review our curricula towards a more food-chain based approach.

Q – Tony Fischer, *Crawford Fund and CSIRO*
One issue to which I think we have not given enough attention is nutrient recycling related to the animal feeding stream. I refer to the intensive chicken, pig and dairy systems that we are finding now everywhere in the world, and particularly in the developed world; and also feedlotting. There are feedlots in the US now that have 200,000 animals at any moment in the feedlot. And there are dairies which have 10,000 cows in the feedlot. I think economies of scale are

driving this, but I worry very seriously about getting the nutrients back from such huge concentrations of animals. I will direct the question initially to Professor Fresco, because The Netherlands has a huge positive phosphorus balance, and I would like to know what you are doing about it.

A – Louise Fresco
Well I would like to separate the 'phosphorus' issue from the entire animal production side. I think a lot of the problems in food waste and feed waste are on the animal production side. One of the key issues in developing countries is the lack of hygiene, the lack of adequate slaughterhouses, the lack of a cold chain, and the lack of understanding – and also quality control in the entire animal chain. Something that always surprised me, even in my years in the field, was that we do not have many countries funding this kind of work and this kind of research, because it also requires some applied research to see what is the best solution. I think there is enormous scope in new technologies for cold chains, for example, that are more energy efficient, and for more training in hygiene, for example.

So the animal production chain – and I include in that the fisheries side – is by far the most fragile when it comes to waste. Yes, horticulture is fragile too, but you can still sell part of the tomato crop, even if the others start rotting. You cannot do that with animals. So there's a fundamental difference that makes the animal production chain more complex. At the same time, the animal chain is really full of excellent proteins, minerals and all kinds of chemical elements that we can use as feed, but in a far higher scaling level of using the waste. To map that out, what can be done in different countries, at different levels of development, I think is a real priority. We are not fully grasping the potential there, let alone applying it.

Now on the nutrient side, you are right. The term 'animal production' means, by definition (unless you have animals grazing freely without any added nutrients), that you are concentrating nutrients, often across continents. The international trade in feed – which is the factor that drives the world's cereal and soy prices in particular – is an enormous factor for the concentration of feed. I think we are, at the university in Wageningen, calculating the optimal levels of feed, and the optimal levels at which you can keep cows in a country that is as densely populated as ours. We are doing pretty well when it comes to retrieving all the nutrients, but there is still waste. Ideally you would not add more nutrients than the animals can actually cope with, so that you have a closed system. And that, I think, is the aim. In the meantime, there is a huge debate within the European Commission which I will not bother you with, on how to actually fix those phosphorus targets; what are the adequate levels; how you monitor it; and so on. If we are not careful, this whole system becomes an extremely bureaucratic procedure, and it then fails to show us that the ideal is not managing phosphorus but managing the whole production system, including the greenhouse gas emissions from animals, for example.

What we do know is that if the feed is not adequately balanced, you get more nutrients that are excreted from the animals, and you get lower quality and lower productivity. So the key word, although it is not a popular key word with

the public, is sustainable intensification, and optimisation of the entire chain. Unless we take that chain approach, we will not solve it.

Q – John Angus, *farmer and CSIRO*
I think producers are highly concerned by loss, and not so highly concerned by non-production up to a point. Now I understand the psychology, from personal experience, but I wonder what the economics are? Is it justified? Are we doing the right thing? Do you believe what I am saying? What can be done about it?

A – Louise Fresco
I am sure there are more questions on the economics of all this.

Q – James Ridsdill-Smith, *Crawford Fund and ex-CSIRO*
I would like to ask whether the word 'waste' is what we should be using at all. Waste from, say, insect damage, is not a real loss; it is loss in today's world. Insect damage is really insects affecting the rates plants grow at, rather than waste. So the same question as John's.

Q – Kim Russell, *farmer and Chair of Southern Farming Systems*
One of the issues we have seen today is the economic issue of using wet compostables and dry, the spectrum of waste streams. Making compost is probably the simplest and most commonly used technique for large-scale waste streams, such as from feedlots and that sort of enterprise. But there is probably not enough work done to identify the most economic place to put that compost. It goes on the ground surface in India and China. We ourselves have been doing some sub-soiling with incredible benefits to soils. So my question is about the economics of the use of those products in the whole value chain.

Daniel Walker, Chair
In summary, three questions there about the psychology of loss compared to forgoing yield, when waste and loss might not be waste and loss but part of the ecology of the system, and the economics of reusing parts of the system.

A – Karen Brooks
I think these are all very important points to bring up, particularly at this time of the day and at this stage of our conversation, because they remind us that (to come back to my comment about the many optimisations that are involved here) not everything that we might popularly identify as waste or loss is actually waste or loss.

To some extent, I think we make the best decisions we can, to make the best use of our resources, given the circumstances that we are working with, and that is the fundamental economics of how we manage these very complex processes. There are elements of the circular economy where we consider that we could do much better if we tweaked the incentives, if we provided more information, if we made people more aware of some of the options that they have. Those, I think, are latent opportunities that we can take advantage of, and we might recognise those as waste or loss that we might want to change. But it is not the case that we will go back to a zero baseline on this, because that would not be economic either. This is a complex challenge of managing resources. We may be simply wondering whether we have the right pricing, the right decisions, the

right institutions on the system to be making the best choices, and I think the answer is that we could make better choices, and that is what we are struggling to do.

Q – Daniel Walker, Chair
Daniel, I wonder in your journey to reducing waste (and you did define loss and waste quite carefully), how do you make decisions about commercial thresholds in changing the way you handle resources within your business?

A – Daniel Lagger
It is a very difficult question. Of course, we always have financial indicators and a lot of other constraints; what is important is that on top of all the things we do which have a financial value, we also do things just because it is the 'right thing to do'. Big companies can also invest some money, with lower financial return, in some priority areas; for example, we have different payback thresholds for energy improvement projects or environmental improvement-related projects than for other capital investment projects, but it only goes up to a certain amount; we need to remain competitive.

Q – Colin Chartres, *Crawford Fund and the Australian National University*
It seems to me, listening today, we have the technical abilities to change things. We are also, through links with the business sector and the supply chain, developing a sort of business model approach and the economic incentives. I want to hear your opinions about whether or not, particularly in developing countries, we have the policy framework right with the governments we are dealing with. I suspect we have not, but I would like to hear your opinions.

Q – Ali Bajwa, *the University of Queensland*
We are talking about food safety and quality assurance. On the other hand, in the developing world, especially in South Asia and many African countries, we have issues of food security. We are talking about how to preserve our resources, and how to improve the quality chain, but if we are talking in a developing-world scenario we most of the time talk about how to improve yield. That is still the major issue in those countries, such as Pakistan, India. I am wondering how we can work together on food security and food safety? Is it a matter of priority only in the developed countries, or is it also important in developing nations? What do we need to put first? Is it food security, and how can we work together on food safety *and* food security, side by side? What kind of policies should be adopted in those scenarios?

Q
I am from Charles Sturt University. Just adding to the points made just now, I am wondering how you develop policy with governments or corporate entities like Nestlé and others, to manage waste etcetera? For instance, how does government develop policy to handle corporate entities' management of waste in an intensive developed country like yours, Professor Fresco, and how, Mr Lagger, do you develop a policy with governments to try and remain a good corporate citizen, and work with governments in developing countries where the challenges are significantly greater?

Q – Malcolm Wegener, *the University of Queensland*
My question follows on from the last one that was answered, and relates to some of the comments that Dr Brooks just made about the rolling incentives and changing practices, which are some of the things that are associated with market failure. Would you go as far as to say there is market failure in achieving your optimal level of food waste? And is it a question of whether we can let companies do their thing, and find profits in reducing waste? Or to what extent should government intervene and try and introduce regulations to achieve this?

Daniel Walker, Chair
In summary, a series of questions there about maturity of policy settings and efficiency versus resilience trade-offs and public–private intersections.

A – Karen Brooks
To take the simple question first, if we look at the developing world, do we have the right set of policies in place to facilitate agricultural growth and development, and appropriate management of waste and loss? And the answer is no, of course we do not. Look at the numbers of hungry people. Look at the numbers of poor people, and look at the magnitude of loss and waste. Even if we do not have precise numbers we know that it is quite large, and much of it is very close to those who are very poor and would greatly benefit from reduction in those losses and waste. So no, we do not yet have the policies in place.

The policies that I see as most important for moving us globally in different directions are those that would remedy the under-investment in agricultural research. It is not just general agricultural research, but very specifically agricultural research that addresses some of the climate challenges, that addresses sustainable intensification, that builds in the new technologies, that will address making the crops and livestock more resilient to storage and to shocks associated with pests.

There are agricultural technical solutions to some of these problems, if we think about agricultural research in new ways, and if there are adequate flows of investment, not just from the international community. This is not a plea to give money to CGIAR. Rather we are very concerned about the adequacy of investment of our partners on the ground. We cannot work together well if our partner organisations in agricultural research in developing countries do not have the support of their own governments. We are very concerned about the flow of resources going into agricultural research in the poorer parts of the world. That is a policy decision, the adequacy of levels of investment by developing country governments.

Also, let us look at the relatively straightforward agenda of addressing losses close to the farm, and in getting products to market. Basically it is a need to be building infrastructure. And yet when the decisions are made about what infrastructure to finance, where to put it, whether to do a road, what kind of power, etc., the question 'What will this decision mean for managing food loss?' is not always included. Often it is simply 'Can we get things to market?'. There is the agricultural and rural development dimension that comes into the decisions about infrastructure planning, but not necessarily the issue of what specific

products are going to be moving over these roads. What kinds of conditions do we need? Do we need water supply in the markets in order to address food safety issues? Where should we be putting the rural electrification? If we added some consideration of managing loss and waste in those decisions about infrastructure, maybe we would get a different configuration, or a different timing of the investment in rural infrastructure. Very important.

We are concerned about the hunger issue. As I said earlier today, we need special instruments to address hunger. It is not just food production and getting products to market at affordable levels. We need specific programs. Safety nets. Social protection programs. We need insurance. These are special purpose instruments that address the hunger in targeted populations. Those are policy issues. I think we have tended, historically, to think of urban development and rural development as separate issues, and to some extent in competition with each other. But I think if we look at the framework of circular economies that we were talking about today, and if we look at the development of supermarkets and the waste management challenge in towns and cities in the developing world, clearly we have to put aside that separation between rural development and urban development, and recognise that there are very strong linkages there, and there is a critical need for investment in municipal waste management, and then to link that in with production processes in rural areas.

I think all of these, the issues of under-investment and policy gaps, are approachable, remediable, through policy reforms, but also very challenging. It is not easy to make those policy reforms. The fact that we have had these problems with us for so long is an indication that they have not been addressed adequately yet. But I think we will also see a tremendous momentum of problems worsening if these things are not addressed. We see the urban development, we see the development of the supermarkets. We see the increase in loss and waste as production increases. There is an urgency to addressing these. I really welcome the chance to look at these issues together.

To the question 'Is there market failure?' my answer is yes. No question. Part is policy failure and part is markets failing because they are not getting the right signals. I think some of those signals can be remedied by regulation. Regulations are hard to enforce, however, particularly in the environments where they are needed most. I think of the area where I live, in the part of Washington, D.C., where there is intensive chicken production with a lot of chicken waste flowing into Chesapeake Bay. That has been regulated for many many years, and yet the enforcement of those regulations has been a real challenge and Chesapeake Bay is still not cleaned up. So I think it is one thing to say 'Yes, there are regulatory solutions to quite a bit of this'. The challenge is to enforce those regulations.

A – Louise Fresco
Shaming and naming, I would say. There is no other way you can get companies to comply, and you have to do that very strongly.

Just a couple of comments. First, I am not sure that you can make a direct link between poverty and waste. I do not think it is that easy. It is not because we have poor people that there is more waste, because in fact what you see is that

poor people are often very creative in using all kinds of by-products, and even consuming products that, in other countries, would be considered already ripe for the waste heap. I think that the relationship is quite complex, and maybe it takes a kind of U-shaped curve, where some of the waste is actually used quite well in poor countries. A key issue is that before waste occurs at consumer level there are lots of other types of losses that poor people cannot address. The basic issue remains the quality of the produce and the low yields as they come off farmers' fields. And that links into the question about food safety and food security.

I firmly believe that you should never separate food safety and food security: the two should be addressed together, because if you have no safety, you also have no security. You do not have the adequate kind of calories according to the FAO definition. There is no way in which we should condone double standards in that respect. So a policy on waste should also be part of a policy on food safety and on food security.

Now do we have a policy failure? Yes, I think we do. But it is a complex one. The main issue is not to have a law regulating waste or waste reduction. It has to do with a lot of physical measures, and even with simple things like Customs regulations. I remember seeing, in West Africa, tomatoes and horticultural products that spent three or four days at the border between Mali and Senegal because they could not get through, because of a combination of corruption. By the way, we have not discussed corruption very much. Corruption is a real cause of food waste because things are held up. There are all kinds of parallel systems using food that is actually off, and bringing it back again into the food chain in a distant way. So let us not forget that dimension. Fiscal and Customs measures are really quite important. I agree with you on the municipalities. They have an important role to play.

The great thing about waste is that it is something that nearly everybody, every consumer, can relate to – and that is a factor we should mobilise much more. Everybody knows waste, and most people, even in rich countries, feel slightly guilty or upset when they have to throw things away. I know a couple of younger generation people who feel it is quite OK to throw away half a chicken, but they will not do it if I am around! I think waste is a fantastic opener of a debate, and a topic that links the urban middle class. Do not forget the middle class in developing countries is also growing by 10–12% per year. The middle class brings a new dimension to the waste problem.

I think the fact that we now have Sustainable Development Goals, and the World Economic Forum, and the Fast Moving Consumer Goods forum, and so on, these actually make the policy failure a lot less of a problem, because at least the big companies are quite in line, the Nestlés of this world, with the governments.

Last week I had a chance to speak at Nespresso with one of Nestlé's directors, and he was proudly telling me, 'You know, we are collecting all these little aluminium capsules'. And I said, 'What are you doing with the coffee drab that is still inside?' And he said, 'That goes to landfill, or it goes to chickens'. But I said, 'You know, that's full of fantastic chemical elements. There is lots of stuff

in there in terms of flavours. All kinds of compounds that are really high-level chemistry. Why not try to take that out?'. Nobody had ever thought about that at Nespresso. So there is still scope, even at Nestlé ... but I'm joking!

More important, I am not so worried about large companies. I think they are aware enough. I am worried about small and medium enterprises because, for them, investing in research – and even monitoring of waste – is much more difficult. That is, I think, where governments and municipalities have to help. To form a roster of best practices. To find easy monitoring techniques that are not too cumbersome for those small companies.

And lastly, the prospect of having a carbon price, at some point in time, and a carbon market, which I think probably will happen at some stage, will help people to look again at the efficiencies all along the chain. Not just in terms of energy, but also in terms of, for example, what can we do to the soil? What can we do to improve soil quality? All that carbon capture, or carbon improvement of the soil will then carry some kind of positive incentive.

Q – Daniel Walker, Chair
From a Nestlé point of view, you manufacture in 85 countries, you export to 189 countries, so you are the beneficiary of an enormous amount of policy around the world. I wonder if you have any reflections from the other side of the fence?

A – Daniel Lagger
Yes, we have concerns and issues. Yes, we have difficulties. All countries are different, with different legislation, regulations and practices, and not always encouraging about what we try to do and achieve. There is not a one-size-fits-all approach, and local conditions may require different approaches. I think that working together at a global level is the first step, and then working locally in the different areas I mentioned, with local partners, is key. That is the only way that we can design systems and operations that make sense for everybody and are adapted to local situations.

Another aspect we focus on is food security and safety: aspects such as traceability, making sure that we know exactly where all the materials are coming from, what the materials are composed of and how they are sourced and produced, are key. I think it is very important that we continue informing consumers about all they may be concerned about, and give full transparency.

Professor Louise Fresco is President of the Executive Board of Wageningen University and Research Centre, one of the leading research institutes worldwide in the field of food, agriculture and life sciences. Louise has served as Assistant Director-General for Food and Agriculture at the UN FAO in Rome, and is a member of the Steering Committee of the FAO High Level Panel of Experts on Food Security and Nutrition. She has conducted field work in more than 50 developing countries, has served on the Supervisory Board of Rabobank, serves on the Board of Unilever, and is a published author and maker of documentaries. Louise Fresco's latest book is *Hamburgers in Paradise: The stories behind the food we eat*, published by Princeton University Press. It follows decades of research and explains how science has

enabled us to overcome past scarcities and why we have every reason to be optimistic about the future.

Dr Karen Brooks joined IFPRI in 2012 as Director, CGIAR Research Program on Policies, Institutions, and Markets. Prior to that she worked for the World Bank for more than twenty years in various capacities, including ten years as Sector Manager, Agricultural Operations, Africa Region, and during the 1990s as Lead Economist on agricultural issues of the transition from central planning in Eastern Europe and Central Asia. Prior to joining the World Bank, she was Associate Professor in the Department of Applied Economics at the University of Minnesota. Karen holds an undergraduate degree in Political Science from Stanford University, and a PhD in economics from The University of Chicago. She has published on issues related to agricultural policy in centrally planned economies, price and land policy in countries transitioning from planned to market economies, and the challenges of youth employment in Africa south of the Sahara.

Daniel Lagger has been in his role as Executive Director, Technical & Production (formerly Operations), since 1 March, 2016. In the preceding three and a half years he was Technical Manager at Nestlé Japan. Daniel began his Nestlé career in 1984 as a Project Engineer in Switzerland. Throughout his 32-year career, Daniel has held different positions in the group, in the Philippines, Thailand and Switzerland. He holds a Masters degree in Mechanical Engineering from the EPFL (École Polytechnique Fédérale de Lausanne) in Lausanne, Switzerland. Daniel believes that the most important part of any role is working as one team to deliver results. Outside of work, Daniel likes sailing, diving and skiing, and discovering new countries.