

CLARITY FOR THE BIOBASED ECONOMY

How standards ma

Clear agreements are needed for the Dutch economy to achieve the goal of growing from its current 7 per cent circular and biobased production to 100 per cent by 2050. Agreements about standards that new materials have to meet, for instance. Not an easy task in a fast-changing world. Developing such standards takes a lot of scientific research.

TEXT ARNO VAN 'T HOOG ILLUSTRATION JEROEN MURRÉ



ke for consistency



More and more food packaging bears the seedling logo for 'compostable', meaning that the packaging meets the European standard EN 13432 and is therefore fit for processing into compost at an industrial composting plant, along with organic waste. Standards are voluntary agreements between market players such as packaging manufacturers and composters about product or material characteristics, standard sizes or measuring methods. EN 13432 states, for instance, that products should disintegrate in less than 12 weeks into pieces of less than two millimetres, and should be completely broken down in six months. But the standard also describes procedures, conditions and the timescale within which the compostability should be tested. 'These are the recurrent features of many standards,' says Maarten van der Zee of Wageningen Food & Biobased Research, who has been doing research on the scientific basis for new standards for over 20 years.

Van der Zee got his doctorate in 1997 for research on the breakdown of biodegradable biopolymers such as polylactic acid. 'At that time I developed all kinds of measuring methods, which is how I ended up in the world of standardization.' He went on to work on research questions related to the characteristics of biobased products, such as plastics that are partly made out of plant-based raw materials. 'How do you determine the biobased content? Often scientific research is needed first before you can neatly encapsulate the appropriate measuring method in a standard.'

TRANSPARENT PLASTICS

Standards often emerge as an answer to developments in society and the need for new policy. Europe, for example, wants to move towards a circular, biobased economy. 'Of course you then have to be clear about what that really means, and how you measure it,' says Van der Zee. 'Whether things are biobased cannot be seen from their appearance. PET, polyethylene or polylactic acid, for instance, are all transparent plastics that can be made out of both plant-based and fossil fuel-based ingredients. You can't see with the naked eye what the proportion of plant-based material is, so you have to measure it.'



‘Standardization doesn’t yet mean the market is developing spontaneously’

Within the EU project Open-Bio, Van der Zee and international colleagues developed a method that made use of the same principle as the carbon dating with which the age of archaeological finds is determined: the presence or absence of the rare radioactive carbon-14 isotope in the material. Van der Zee: ‘Through solar radiation, there is a tiny amount of carbon-14 in the atmosphere and therefore also in plants, which have absorbed that carbon dioxide from the air. But it is not present in crude oil. Plastic in which no carbon-14 can be detected is therefore of fossil fuel origin. And the level of carbon-14 can be indicated using a scale from 0 to 100 per cent. A product that is a mix of fossil and plant materials will be somewhere in the middle. This measuring method has now been established by the European Committee for Standardisation (CEN) in the European standard EN 16640. This can be used by policymakers for stimulating the use of plant materials. Subsidy schemes, for example, can include requirements for the composition of materials, which can be measured using standard EN 16640.’

MARKET INFLUENCE

Standards have to be technically feasible and assessable. But you also need market players such as manufacturers to be on board, and to benefit. Measuring isotopes may sound like a fool-proof method of determining the proportion of plant materials, but some manufacturers feel cheated by it. It only looks at the biobased proportion of the carbon that is present, while plant materials often contain a lot of other elements – far more than fossil fuel-based materials. If a manufacturer replaces half the petroleum-based plastic with starch-based plastic, the isotope method won’t come up with a figure of 50 per cent, but only roughly 20 per cent as that is the proportion of biobased carbon. That difference is difficult to explain to customers, and therefore difficult to sell, says Van der Zee. ‘When this came up a few years ago, that biobased percentage was very important in the marketing: the higher the better. That is why an additional standard was developed (EN 16785-1), which uses a calculation based on the ingredients used. This shows that the market has an influence on the development of standards too.’ Meanwhile, the biobased percentages

are no longer the only thing that is looked at, says Van der Zee. ‘The sustainability and recyclability of materials are taken into account now too. Take for example the use of water and raw materials during production, as well as what happens to the leftover waste: it is recycled, composted or incinerated.’

BIOBASED BARRIERS

Although various standards are now enforced, this hasn’t yet resulted in the market for biobased products developing automatically, says Ortwin Costenoble, who works at NEN (the Royal Netherlands Standardization Institute) and as a project coordinator at Open-Bio and a second EU project WUR is collaborating on: STAR4BBI. The main focus of STAR4BBI is research on the question of why there are still barriers to the introduction of biobased products. Costenoble: ‘Some composting companies are opposed to letting people put bioplastics in the green bin for food and garden waste. They are afraid that more non-compostable plastics will get into the green waste because households are careless about sorting their rubbish. Then the companies have to remove that before or during the composting process, increasing the chances that compostable plastics will get removed too.’

Another sticking point is that common composting practice has deviated from the situation on which the test standard for compostable waste is based. ‘Packaging companies have designed a product that meets the requirements for disintegration, based on the time it takes for regular organic kitchen and garden waste to break down: 12 weeks. But in the interests of efficiency and cost effectiveness, composting companies have been using shorter and shorter cycles, sieving out material that hasn’t decomposed sufficiently and adding it to the next load of green waste to be composted further,’ explains Costenoble. ‘In short, common practice has changed.’ That leads to doubts among producers as to whether their products still meet the criteria. Van der Zee: ‘So it would seem like a good idea to find out whether the testing method should be adapted to the situation in which composters put undigested organic material back into the process along with fresh supplies of green waste.’ >



‘A set of standards like this is an important condition for achieving a cycle of reuse’

WHAT ARE STANDARDS?

Standards are agreements on things like standard sizes, performance criteria and material characteristics that increase the consistency of products and production methods. They ensure, for example, that plugs always fit sockets. Every organization is free, within the limits of the law, to make such agreements within the organization or with other organizations. Standards that are developed under the supervision of the Netherlands Standardization Institute (NEN) are known as NEN standards.

Organizations are free to apply standards or not. Some buyers ask for them. NEN standards can also help producers meet legal requirements. Anyone wanting to prove that a product or process meets the requirements of a standard can opt for certification. Sometimes that can be combined with a label.

Standards have been agreed in the biobased sector as well. Several standardization committees are active in this field, including the Biobased Products committee, which has been working since 2010 on general standards for biobased products, such as the content of biogenic material, and how that is assessed, the life cycle or the sustainability.

One example of a biobased standard is the one used to determine the biobased content of a product: NEN-EN 16640:2017, ‘Bio-based products – Bio-based carbon content – Determination of the bio-based carbon content using the radio-carbon method’. Details are given of the measuring methods you can use for this and how to calculate the proportion of biogenic material using the results.



One of the policy recommendations from the STAR4BBI project is to use biodegradable plastics mainly for products that the compost company can also expect to get added value from. That way, packaging manufacturers can enhance their image with a green and compostable product, while the composters get a new waste stream that is profitable for them. Costenoble: ‘Take coffee pads or teabags, for instance. Their contents are largely organic matter – coffee grounds and tea leaves – which could swell the volume of compostable waste. So make sure you incentivize producers to use biodegradable plastics for those products.’

The idea of being able to put all coffee pads and capsules and teabags in the green waste bin in a couple of years appeals to Erwin Vink, sustainability manager at NatureWorks, the world’s biggest producer of polylactic acid (PLA). PLA is biodegradable in an industrial composting plant, where it breaks down so that bacteria can consume the lactic acid. It can also be used for making coffee capsules and replacing the polypropylene in teabags and coffee pads. Vink: ‘We would like to see more of these kinds of useful compostable products coming on the market. You could say, there is only a little bit of tea or coffee in a capsule or teabag. But globally it adds up to quite a mountain. Composting is the only right way to process tea and coffee waste. So make the packaging compostable too. The Coffee and Tea Producers branch organization has since taken up this idea and started a project aiming at a sector-wide transition to compostable coffee pads and teabags by January 2021.’

COMPOST HEAP IN THE GARDEN

Vink says composting companies tend to be a bit conservative. So last year, Maarten van der Zee started a study on how 10 compostable products perform in industrial composting plants. ‘That study showed that the biobased teabags and coffee pads compost well in the plants. Of course some products break down faster than others, but that is no different with “normal” organic waste: grass and lettuce also breaks down faster than orange peel or twigs from the garden.’

Here, Vink touches on another sticking point: the misunderstanding that compostability is a universal



characteristic. ‘People assume that compostable packaging will break down in their own compost heaps in the back garden too, whereas that is often not the case. In an industrial installation, the temperature can go up to between 55 and 65 degrees due to bacteria and heating, so the breakdown process goes a lot faster than in the compost heap.’ To make that difference clear, a separate standard is under development for products that are compostable at home. So by the end of next year there may be two European standards, with two logos, for two forms of compostability. But Vink is not in favour of people composting packaging at home. ‘A compost heap in the back garden is not a reliable environment for composting biodegradable plastic. Everyone goes about composting in their own way, and how the composting goes is strongly affected by the weather conditions. What is more, with home-composting, the emissions are not under control, which means that as a waste disposal method it is much less circular than it appears.’ Van der Zee agrees with him on this. ‘Home-composting is attractive for cutting the municipal costs of waste collection and disposal, but that doesn’t make it sustainable or circular. I would prefer to see more effort going into standards for making it easier to recycle and reuse materials.’

STANDARDS FOR RECYCLING

Standards play an important role in the reuse of regular plastic from household waste, too. Currently in the Netherlands, about 30 per cent of discarded plastic is recycled into material for new products such as garbage bags, buckets, bottles and foils. Recycling companies produce what is known as recyclate: granules that manufacturers can melt in order to make new products with them. But demand does not meet supply in the recycling market, notes Ingeborg Smeding, the recycling project leader at Wageningen Food & Biobased Research. ‘We have carried out research which showed that recycling companies have difficulty selling their recyclate. And producers say they can’t find enough suitable material that meets their needs.’

The odour of recyclate is one factor: recycled plastic often has a smell that manufacturers don’t want for their products. Smeding: ‘Colour variation is another important



MAARTEN VAN DER ZEE
Senior Biobased Products
researcher

point. It doesn’t matter if recycled plastic granules are grey, as long as they are always the same shade of grey. There are still no standards for those kinds of material characteristics. What you see is that every recycling company interprets it in their own way. They make datasheets with the technical details about every batch of granules, but that makes it very difficult for manufacturers to compare batches of plastic and suppliers.’

So there is clearly a demand from the market to increase uniformity through standardization: a description of a fixed set of test characteristics for a batch of recycled plastic for a specific application. According to Smeding, such standards could be about composition, purity, colour, smell and mechanical characteristics such as fluidity at a particular temperature. ‘The standards could vary per product, because there are different requirements for soft drinks crates than for plant pots or shampoo bottles. Ultimately, you want a standardized classification that provides clarity on that. A set of standards is an important condition for closing the circle of reuse and significantly increasing the circularity of the Dutch economy.’ ■

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