

Kassel Project

*Information about the world's
only pilot project for marketing and
recycling of compostable packaging
made from biodegradable polymers*





New closed-loop Waste Management in Practice

From Nature, to Nature - This is a novel concept for high-tech products like plastics. The role model for the development of biodegradable polymers – BDPs – is Nature's cycle: most BDPs today are produced from renewable raw materials. BDP products can be recycled efficiently after use, e.g. by composting. They decompose into humus, water and CO₂, which serve as the raw materials for the next generation of BDPs, and so the cycle continues. This revolutionary approach is an example of sustainable management. BDPs have enormous potential to help us conserve finite mineral oil resources and to lessen the impact on the world's climate. Packaging materials made from BDPs constitute an alternative to conventional plastic packaging.

In Germany, as in other countries, BDP products can be recycled by composting after use. More than 60 percent of all German households have been issued with organic waste bins ("biobins"), whose contents

This pilot scheme, the only one of its kind in the world for the marketing and recycling of BDP packaging, addressed two complex issues:

- Waste management: Are consumers able to consciously separate specially labeling packaging into bio-waste bins without increasing the quantity of extraneous materials ("impurities") that disrupt the system? How do bio-waste collection and the composting process work? What is the quality of BDP compost like and is it an effective fertilizer for agricultural purposes?
- Consumer acceptance: How do consumers react to the new packaging – do they appreciate the benefits, will they buy it, do they understand the recycling concept? These questions were investigated by means of market research.

The role model for the development of biodegradable polymers – BDPs – is Nature's cycle



are collected for composting. This means that over six million tonnes of bio-waste is sourced from households and recycled into compost or humus – a natural method of waste disposal. BDP products thus can profit from the existing composting infrastructure to get "bio-recycled" (organic recycling).

This sounds good in theory, but does it actually work in practice? When it came to setting down appropriate legal framework conditions, especially, a number of questions arose to which the answers were unknown – so a pilot scheme was set up to provide them.

The Kassel scheme turned the BDP closed-loop model into reality. For the first time in Germany, a dual disposal system for compostable sales packaging was created officially in accordance with packaging regulations. Operated by Interseroh GmbH in compliance with § 6.3. of the packaging directive, the Kassel scheme freed the packaging producers of their take-back obligations. The city of Kassel, represented by the municipal refuse company, and the composting plant were compensated for providing their recycling services.



Organization of the Project

Federal State Minister Eichel receiving flowers in transparent film wrapper, point of sale promotion in supermarket

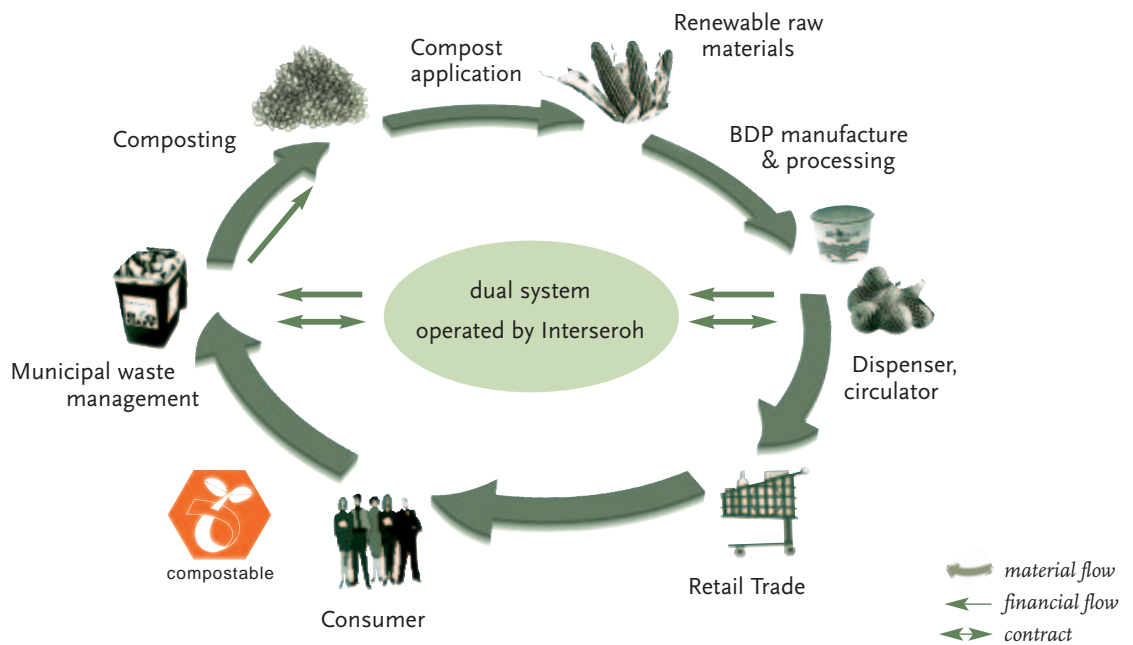
The nature of the problem resulted in a complex project scheme. More than 30 protagonists from six different sections of the community were involved.

1. Industry: Manufacturers and processors of BDP raw materials as well as packaging enterprises from a wide variety of business areas
2. Kassel retailers: Grocery chains and specialist stores
3. The waste-disposal industry: Municipal refuse company, the composting plant, providers of disposal services and a certification institute
4. Communications service providers: Advertising and design agencies
5. The public sector: Federal Ministry of Consumer Protection, Food and Agriculture, Hessian Ministry of the Environment, district government and the city of Kassel, the Göttingen factory inspectorate
6. Science: Chair of waste management at Bauhaus University of Weimar (Prof. Dr. Bidlingmaier) and a market-research institute



The pilot scheme was funded jointly by industry and the Federal Ministry of Consumer Protection, Food and Agriculture through its financier Fachagentur Nachhaltige Rohstoffe e.V. The scheme was coordinated by lichtl Sustainability Communications. An expert advisory board consisting of representatives from important associations (ANS, BDE, DBV, BGK, BHE, EHI, IBAW, VKE, VKS) and federal ministries (BMVEL, BMU/UBA, BMWA) were on hand to advise the scheme managers.

Schematic diagram of the Kassel pilot project: Closed-loop waste management in practice



What was on Offer?

From May 2001 to November 2002, retail chains, including Edeka, REWE and tegut sold about a dozen products in compostable packaging. Only packaging which had been checked and certified for compostability was admitted. Diapers, biscuits and confectionery were wrapped in film based on renewable raw materials. Many stores offered starch-based carrier bags that could also double-up as bio-waste bags. New products that were launched included knot bags for fruit and vegetables, a new transparent punnet made from cornstarch for organically grown mushrooms, flowpack packaging for organically grown peppers and a type of butter packaging were new product launches. Service packaging available included compostable party flatware and drinking cups. Flower shops wrapped their plants in a crystal-clear film, herbs were grown in compostable plant pots and delicacies were sold in trays made of corn. A new product, a BDP cup with a compostable lid for dairy products, was tested at the end of the scheme.

How was it advertised?

A new labeling system for BDPs was tested in Kassel. All the BDP packaging was marked with a hexagon for ready identification and separation by the consumers. A promotional campaign held under the motto “the sixth sense” explained the meaning of the hexagon with the compostability symbol in its centre to the 200,000-strong population.



compostable

Figure: The BDP packaging symbol

It started with house-to-house circulars and was backed up by roadshows in public places and schools along with notices and advertising campaigns in shops. Details of the scheme were also posted on the internet. The costs of this promotional campaign came to about EUR 2.40 per household.

The theme was taken up regularly by the local press and specialist media. And, at home and abroad, it was covered in some detail by various professional journals.

Presenting different BDP packaging in the supermarket, compostable plant pot





What do Consumers think of the Idea?

Extensive market research was performed to analyse consumers' attitude to the new packaging and the method of recycling it. Two major surveys in September 2001 and in November 2002 came up with a number of important insights gleaned from 600 interviews.

Easy to understand and thought-provoking

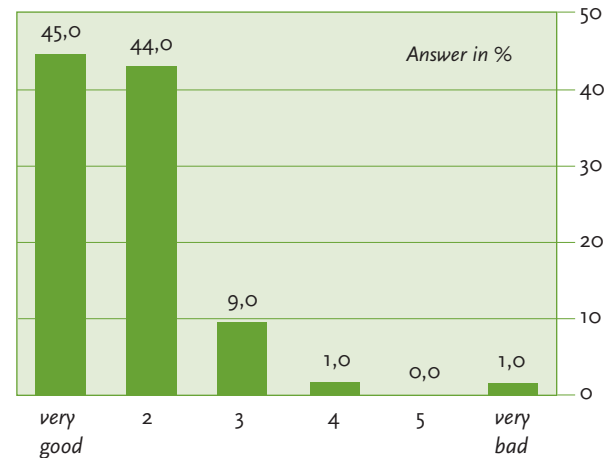
By the end of the scheme, 82 percent of Kassel's population knew that the hexagon was the symbol for BDP packaging. This shows that the simple, unmistakable symbol and the back-up campaign were effective.

Popularity and quality

80 percent of Kassel's population which had bought the new products thought the quality was "high" or "very high". 87 percent said they would buy them again. Almost 90 percent approved of replacing conventional plastic packaging by compostable plastic packaging. 75 percent said they would either at least consider or definitely accept additional costs for BDP packaging.

Communication campaign in Kassel:

What do you think of the idea of replacing conventional plastic packaging by compostable BDP packaging?



Suitable for many products

Bags, such as carrier bags and knot bags used in fruit and vegetable sections, were especially popular. Consumers also liked the fact that the bags additionally could be used as hygienic containers for collecting organic kitchen scraps. BDP packaging is ideal for

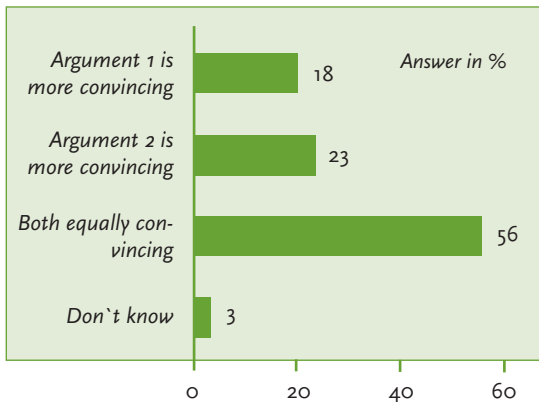


*Event for children,
Federal State secretary
Berninger is cooking
in a supermarket*

fresh food, such as fruit, vegetables and dairy products as well as organically grown produce. Many of Kassel's population wished that a wider range of BDP products had been available.

Which of both arguments do you find to be more convincing?

1. The packaging is environment-friendly because its made of renewable raw materials.
2. The packaging is environment-friendly because of its compostability.

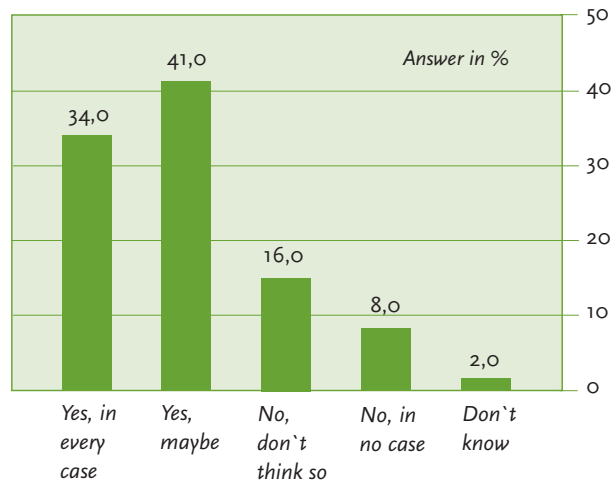


Very environment-friendly

Consumers regarded BDPs as environment-friendly technology with a promising future. Biodegradable polymers evoked higher ratings for their environment friendliness than did multi-trip glass packaging and paper. When told about how renewable raw materials can have a positive impact on climate change, consumers were very favourably disposed to BDPs.

BDPs have two important advantages: they consist of renewable raw materials and are compostable. Consumers considered both features to be relevant but had no clear preference for either of them.

Would you, in principal, pay more for products or packaging made from compostable bioplastic?



Good for sales

Kassel retailers threw their full weight behind the scheme. At the start, especially, they had reservations and were sceptical due to logistical bottlenecks in the regional test market and the pricing of the packaging. But consumer demand for the new materials soon changed their minds. With certain products, such as organically grown peppers wrapped in BDP film, the use of BDPs actually led to increased sales. One branch of a retail chain in Kassel sold more goods than in comparable regions where the selling point »BDP packaging« was missing.

Shopping bag, transparent wrapper, drinking cup



What did the scientific Investigation of the Waste Management System reveal?

The waste studies essentially addressed the following questions:

- How will consumers react and how will they separate the products after use? This was studied by analysing waste streams and disturbing contents (“impurities”) in organic waste collection bins.
- What insights were gained concerning BDP processing in the composting plant? This was investigated by studying the influence of BDP packaging on the composting process in one facility.
- What is the quality of the compost produced from BDP containing organic waste? Is its performance as fertilizer different from that of other quality-assured composts? This part of the studies dealt with the agricultural application of BDP composts.

BDP products in Kassel: Cup made from PLA, compostable cutlery



Recovery rates

A number of analysis campaigns (eight of them quantitative) were carried out during the pilot project to determine the composition of the various types of waste generated in Kassel, namely organic waste (“bio-waste”), packaging waste of the Dual System Germany (DSD “green dot”) and the municipal solid wastes. The results were compared with those of an earlier status quo analysis campaign (August 2000). Analytical parameters included the percentages of impurities in the organic waste (“biobin”), and contents of BDP in the various waste streams.

Altogether, 31 tonnes of BDP packaging was delivered to Kassel during the pilot test. The highest percentage of BDP found in the bio-waste during the scheme was 0.5 wt percent. Expressed in terms of the total of 6 million tonnes of bio-waste generated nationally, this would translate to at least 30,000 tonnes of BDP products in Germany (assuming a 100 percent recycling rate through composting). Thus, roughly 30 percent of the current estimated market potential for BDP packaging in Germany had been mapped.

The recovery rate in bio-waste bins, i.e. the proportion of BDPs in the bins relative to the total amount found in the waste, from various types of urban area structures was also studied. The results varied according to urban area and the type of building development, with the average recovery rate being approx. 65 percent.

As for the volume demand of BDP products in bio-waste bins, there was no significant change in the used bin capacity. The usual seasonal fluctuation in bio-waste levels, was found to exert a much greater influence on the collection bin capacity. So, in this regard, collecting BDP products along with organic waste in this existing collection system does not cause any problems.

“Impurities” in organic waste collection bins

Levels of impurities (plastics, metals etc.) in the organic waste did not change significantly during the investigations. Minor fluctuations only were recorded. The amount, 0 to 2 percent, is a usual level for urban areas. Thus, the collection of BDP did not influence the quality of organic waste.



Processing in the composting plant

The impact of BDPs on the source separation during processing was studied by adding defined quantities of BDP packaging to the organic waste. This provided information as to whether BDPs can be detected during manual source separation, how much of them are mistakenly removed and how they influence the efficiency with which impurities are removed. Impurities are removed from organic wastes at the

Nevertheless, comparisons cannot be made with other composting facilities, since they employ different methods to remove impurities, such as mechanical upstream and downstream screening, in which the packaging size is the determining factor.

The results do, however, afford insights into how the method might be optimised. Plants that employ manual source separation would likely also benefit from mechanical pre-processing (generally screening)



Göttingen composting facility by a manual source separation process on a conveyor belt before entering the composting section. This practice differs from that in other facilities where the impurities are removed mechanically by screening aggregates before or after composting process.

The results of the studies varied according to belt speed, the amount of impurities and the BDP fraction. Impurities were removed effectively if they were present in only moderate levels and if the BDP fraction was not too high. In such cases, the quantity of BDPs removed mistakenly was relatively small. Where the organic waste was highly contaminated (percentage of impurities higher than five percent) and the BDP fraction was high, the success rate decreased – the workers had quickly to evaluate which objects were impurities and which not. Due to the similarity of BDP with conventional plastic packaging the quantity of impurities removed decreased, and more and more BDPs were mistakenly removed.

of the incoming organic waste stream and slower throughput. This would increase efficiency and ensure that the BDP products reach the composting section without being mistakenly removed to any significant degree.

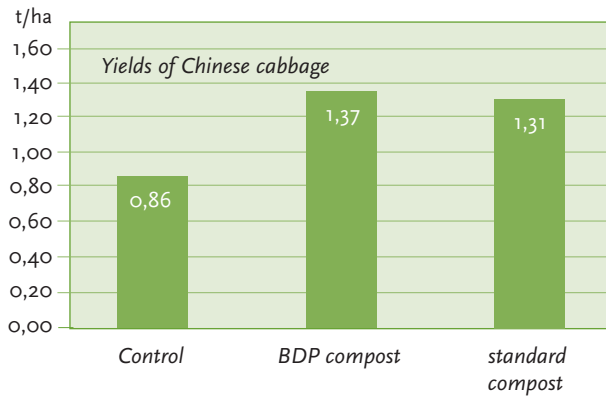
The BDP packaging itself did not impair the composting process. Machines as e.g. turning units were not damaged or negatively influenced by the BDP packagings. The property of compostability itself was not investigated since only certified products were employed that meet the standards of DIN V 54 900 or EN 13432.

Assortment of compostable products

Use of BDP composts

The quality of the composts produced from Kassel organic wastes was supervised continuously during the pilot project. This involved qualitative monthly analyses campaigns related to their nutrient and pollutant levels in accordance with RAL-GZ 251. The results were compared with those of a reference analysis carried out before treatment with BDPs. The co-composting of BDPs did not affect the quality of produced composts.

Impact of BDP-compost on the yield of chinese cabbage



BDP compost as fertilizer was examined in agricultural application: Cultivation of chinese cabbage

An agricultural application test with matured compost made from organic wastes containing 1 wt percent of BDP was performed. The trials compared the fertilizing effects of matured compost, made with or without BDP, with that of a mineral-based fertilizer applied in accordance with best practice as well as with a non-fertilized control. The compost was applied to the soil at an equivalent of 30 tonnes of dry mass/hectare.

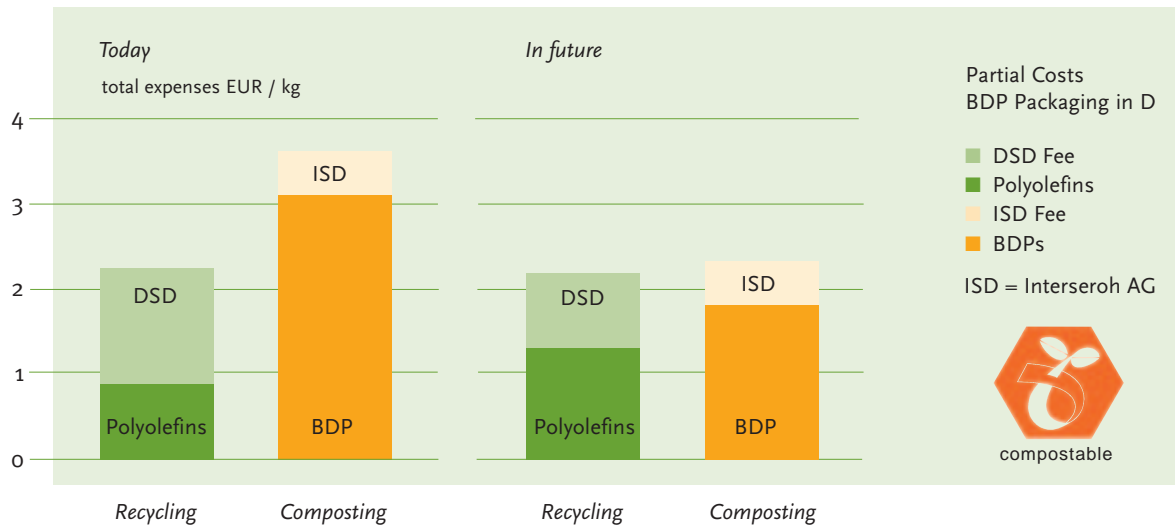
Yields of Chinese cabbage grown with matured compost made from organic wastes containing BDP proved to be normal. They matched those of Chinese cabbage grown with matured compost from organic waste without BDP, and its mineral counterpart applied in accordance with best practice. The addition of BDP into the organic wastes related to produced composts was not found to affect either the yield or the quality parameter of the Chinese cabbage. Nor did the use of matured compost from organic waste containing certified BDP have any effect on soil properties.

The trials showed, therefore, that BDPs can be recycled by common recovery and composting with municipal organic waste. The resultant quality-assured and thus high-quality compost is suitable for agricultural purposes.





What Significance does the Pilot Project have for the Development of the BDP Market?



*Graphic:
Competitiveness of
BDP packaging in
Germany when
disposal costs are
included*

If the Kassel scheme could be implemented throughout the country, this would boost development of the BDP market enormously. Composting as a means of recycling BDP packaging offers considerable cost advantages over recycling of conventional plastic packaging. The cost of the dual system operated by Interseroh in Kassel is about EUR 1/kg lower than the fees charged by the DSD system for plastic packaging. This offsets some of the cost disadvantage of the packaging, which is more expensive at the moment but is certainly better in terms of its effects on global warming. When economies of scale of BDP production as well as rising mineral oil prices are taken into account, BDPs will be almost as competitive in the long term.

The successes of the pilot scheme are already apparent. BDPs as a class of material have grown in overall popularity, and development of new products has been initiated. Consumers approve of them, they understand the advantages and recognize the waste-management implications. The positive results gained from the accompanying waste-management studies open up the possibility of running the Kassel waste-management scheme in other regions.

*From the raw material
to the end product:
Corn, PLA granules,
film*



What next?

The Kassel pilot scheme demonstrated that reservations about collecting BDPs in bio-waste bins can be dispelled. Consumers are able and willing to separate BDPs from conventional plastics. For the implementation of the BDP closed-loop waste-management scheme demonstrated in Kassel throughout Germany, statutory specifications should be established that take account of the products' low dissemination rate during the market introduction phase and the special advantages that accrue from BDP disposal. Current BDP provisions in waste legislation are still inhomogenously and restrict product choice without proper reason. Legislation could significantly boost development of this new technology.

One key to accelerate market introduction of the products lies in the area of communications: the industry still knows far too little about the technology's advanced state and the extent of consumer acceptance. Informed consumers in Kassel recognized the advantages of the products and demonstrated not least through their buying habits and willingness to separate that they very much appreciate the new products.

Various applications of BDP in Kassel.

But they have to be offered these in the first place. For a full-scale market launch, the attitude of the retail trade is crucial. Ultimately, it is the range of products on the shelves that governs what consumers buy. So far, little BDP packaging is to be found on German retail shelves, in contrast to the situation in other EU countries. Consumers will initially have to pay more if they want environment-friendly products. Supporting measures from the state could help to lower the barriers to introducing this important innovation onto the market.





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