# Bio Information Bulletir

**Market & Chains** 

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# Natural packaging for biological products

How eco-friendly renewable and biodegradable plastic packaging is? The packing industry has difficulties in finding this out and thus making deliberate choices. In the "Naturally Packed" research as much information as possible has been collected and resumed



Thanks to packing, products can be conserved longer and can be handled in a more hygienic way. Biological products can be distinguished. But after use, the packing becomes domestic waste. Consumers can get irritated because of superfluous or wasteful packing. Buyers of biological food may be even more critical. If products really need a packing, this has to be as sound as possible. Actually there are many kinds of packing available that are renewable, biodegradable or compostable or have a combination of these features.

### **Definitions**

*Renewable* means that packing has been made of natural or agricultural materials. This is not the same as reusable, where a material is used once again.

*Biodegradable* means that a material can be decomposed by fungi, plants, insects or other organisms. Renewable materials often are biodegradable, but not always. Think of shrimp shells, rubber and pine resin. On the other hand, petrochemical materials sometimes can be biodegradable, like Ecoflex.

Compostable means that a material is decomposed during an industrial process, at a temperature between 60-70°C. Sometimes this is not possible to reach these temperatures in a home composter bin.



# **Ambition**

People are very interested in conservation, that's why the biological market is growing. Therefore, the sale channels have to be broadened and the range of biological products has to be enlarged. The industry wants to develop its top position as a sustainable all round concept, a.o. by developing 'food concepts'. Cooperation and the establishment of new relationships are of great importance. The biological industry aims at an annual growth of 10%. Improvement of efficiency, economy of scale and innovations play an important role in order to reduce additional costs.

# Current research

- BIO monitor
- · Lactic acid in brine baths
- · Consumer research
- Marketing, sales and logistics
- Bio added value
- · Are additions an added value?
- Safe and healthy







# Flexible film Flow pack Shrink film Open tray Top seal Clip cover

## Materials and applications

The number of possibilities for the packing of fresh food stuff and products in renewable and biodegradable materials is growing very fast: there are applications for flow packs, open bags, shrink film, open tray, clip cover, top seal and flexible film (see figure above). There are also consumer articles like waste bags, disposable tableware, (beer) cups, etc.

Renewable, biodegradable packing types are (see table 1):

- Lactic acid (PLA): made of corn. Best known en most applied.
- Starch blends: a mixture of starch and a range of biodegradable polymers.
- Ecoflex blends: a biodegradable material that is made out of different chemical materials.

# Peppers and vine tomatoes better conserved in PLA

The quality of peppers and vine tomatoes that are packed in PLA trays and films seems to be better than in traditional plastics. This is the result of a recent research by the University of Wageningen in the Netherlands. Mr. Paul Hendriks, responsible at Eosta for the packing of Nature & More, is satisfied with the results. 'We have been using PLA for seven years now, and realised that our fresh products can be conserved an extra two days in this type of packing. We are happy to know that scientific research confirms our experiences. Retailers can reduce the losses in shops and at the same time do something good for the environment. The message around environment friendly packing is difficult, a.o. because it is not yet being reused. We are actually studying this problem in a working group.'

- Wood fibre pulp: application in open trays (moulded fibre trays). Only trays made of paper fibres that have not been used before, can be composted. The more current moulded fibre trays of waste paper are not composted because of the presence of ink and glue.
- *Pressed sugar cane fibres*: application in open trays.
- Coated cellophane: Natureflex produces different forms for a limited number of food stuff like confectionery products.

The renewable and/or biodegradable packing normally offers the same protection against deterioration and loss of product as conventional packing does. Some combinations of packing and product are less preferable, like PLA for cheese. Due to the permeability of the material, the cheese dehydrates too fast. However it is also possible that an environment friendly packing gives a better result, like a PLA flow pack for peppers and vine tomatoes. (see frame).

# Environmental advantages

It is very difficult to determine the environmental advantages of renewable

biodegradable materials. There are different standards, like toxicity and water consumption, but efficient methods and data are not always available. In the 'Naturally Packed' research, the energy consumption and the emission of greenhouse gasses have been taken into account, as from the start of the production of plastics (extraction of raw material) until the moment the consumer drops the packing in the waste basket, the kitchen and garden waste basket of the bag for the separate collection of plastics.

Most information is knows about polylactide acid (PLA). There are some environmental studies about trays made of pressed sugar cane fibres and films made of starch blends. This contrasts sharply with other materials, like Ecoflex, about which hardly any information is available. That is why it is difficult to weigh the environmental advantages. However, some general conclusions can be made.

In general, renewable/biodegradable packing is indeed more environment friendly than conventional packing (see table 2). All PLA materials have better results than traditional plastic packing.



Table 1. Features of renewable and biodegradable materials							
Type of packing	Origin		Waste feature				
	Renewable (natural)	Petrochemical	Re-usable	Bio- degradable	Compostable	Burnable in incinerator	
Lactic acid (PLA)	+	-	+	_	+	+	
Starch blends	+	-	+	+	+	+	
Ecoflex blends	-	+	+	+	+	+	
Wood fibre pulp (moulded fibre trays)	+	-	+	+	+ (only for new fibres)	+	
Pressed sugar cane fibres	+	-	-	+	+	+	
Coated cellophane	+	_	-	_	+	+	

Type of packing	Packing	Actual use	Environmental effect compared to conventional plastic packing	
Non deformable	Moulded fibre /PF1 trays	Soft fruit, vegetables		
	Moulded fibre clip covers	Eggs	+	
	Pressed sugar cane fibre trays	Vegetables	+	
	PLA cups	Beer cups, disposable tableware	+	
	PLA trays	Vegetables	+	
	PF <sup>1</sup> form parts and trays	Vegetables, eggs	+	
Flexible	PLA film²	Vegetables	+	
	Starch blend shrink film	Vegetables (cucumbers)	No information	
	Starch blend films	Potatoes, carrots	?	
	Starch blend films	Plastic bags, small plastic bags, garbage bags	+	
	Starch blend-Ecoflex-films <sup>3</sup>	Garbage bags	-	
	PLA-Ecoflex blend film <sup>3</sup>	Plastic bags, freezer bags	No information	
	PLA-Ecoflex blend nets <sup>3</sup>	Vegetables: fruits, onions, Brussels sprouts, etc.	No information	
	Natureflex	Confectionery	No information	
		Possible use		
	PLA cup with PLA film or metallized PLA film	Yoghurt, desserts	+	
	PLA with aluminium coating	Chips, nuts, savoury snacks	+	
	PLA tray with PLA-SiOx-PLA or PLA-melamine top film <sup>4</sup>	Nuts, fresh meat, cheese, sandwiches, conservable salads	+	
	PLA bottle <sup>5</sup> and jar	Water	No information	

 $<sup>^{\</sup>rm 1}$  PF is  $\it paper\ foam$  , which is a starch product.

<sup>&</sup>lt;sup>2</sup> PLA film: A firm glasslike film with a slightly higher water steam permeability than the conventional OPP film, and reasonably comparable for gas permeability.

<sup>&</sup>lt;sup>3</sup> Ecoflex is like rubber and makes the firm PLA and starch blends more flexible. The combination is a strong and flexible packing.

<sup>&</sup>lt;sup>4</sup> SiOx: glasslike material, melamine: not in production yet.

<sup>&</sup>lt;sup>5</sup> PLA bottle: higher gas permeability than PET bottle. When not coated, it is only useable for relatively easy drinks like mineral water, non-sparkling sodas and milk drinks, otherwise the packing might create a vacuum and therefore the bottle will be deformed.



# 'We can now give better advice to customers'

Leo de Cock Aardappelen, a potato firm, packs about ten per cent of its potatoes in renewable biodegradable packing: PLA packing for a kilo of potatoes, and starch-PLA blend films for larger quantities. 'Our clients are indeed interested, but in some cases they return to the traditional packing', Mariska Werring states, 'because the prices of renewable biodegradable packing are higher and sometimes the features are less good. The packing decomposes faster, which of course is what we aim at, but if the stock turnover of the potatoes is not that big, there is a problem. Werring says the study 'Naturally Packed' is a boost. 'It is a great benefit. We now have a document which helps us to advise our clients. Environment-friendly quality is quite complicated.'

### Perspectives

The commercial aspects of renewable, biodegradable packing are positive. Consumers think positive about this kind of packing. However, buyers and retail often hesitate due to the higher cost. Non deformable plastics are at least 5 to 10 per cent more expensive and films are even twice as expensive. The materials are not very well known yet. People doubt about the storage life of the products and there is confusion about the environmental effects. Another argument is the handling of this packing, or the way they can be integrated into the logistic system and the total product range.

An important point of attention is the re-usability. About one third of the Dutch packing waste is separated. The bigger part ends up in an incinerator. This is a missed opportunity for different renewable biodegradable packing. This packing means an even larger benefit for the environment if they are reused in a better way. Therefore, packing can be collected, separated and processed through the actual collecting structure. There are no technical problems; it only needs some modifications in the sorting companies.

# Information

You will find some detailed information in the report "Naturally Packed; Environmental effects of renewable biodegradable packing" by Ulphard Thoden. It can be downloaded at http://edepot.wur.nl/161861.

Bioconnect aims to continue developing and reinforcing biological agriculture by initiating and executing research projects.

Within Bioconnect, entrepreneurs (from farmers to shop owners) collaborate with educational and research institutions as well as consultants. This results in a demand-driven approach, which is unique in Europe.



The Dutch Ministry of Economy, Agriculture and Innovation is financing the research projects.



Ministry of Economic Affairs, Agriculture and Innovation

The Wageningen UR (University & Research centre) and the Louis Bolk Institute carry out the research. Actually, there are about 120 research projects for biological agriculture.



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