FlexiGreen

The Bio Plastic Specialists

100% Biodegradable & Compostable Biopolymers for Agricultural Applications

Solution for Agricultural Plastic?

- Conventionally, plastic can take about 1,000 years to degrade…
- For this reason many people and companies have decided to reduce their use or purchase products that don’t contain plastic.
- So is there a solution in the case of agricultural plastics?

Comparison – Compostable, Oxo-degradable & Conventional Plastic

EcoFlex Bag filled with organic waste

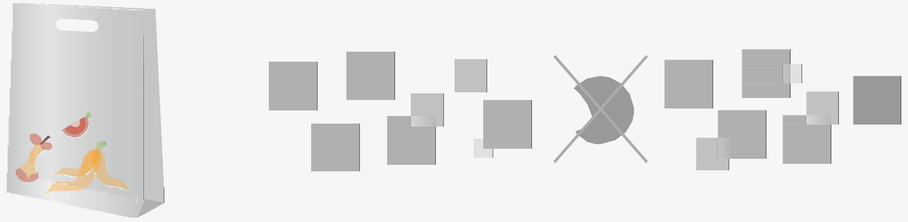
Complete biodegradation to:

- Water
- CO2
- Biomass

Oxo-degradable Bag filled with organic waste

- No complete biodegradation
  (does not comply with international composting standards)
- Disintegration to plastic fragments (PE)
- Premature loss of mechanical properties upon exposure to strong light

Polyethylene (PE) Bag filled with organic waste

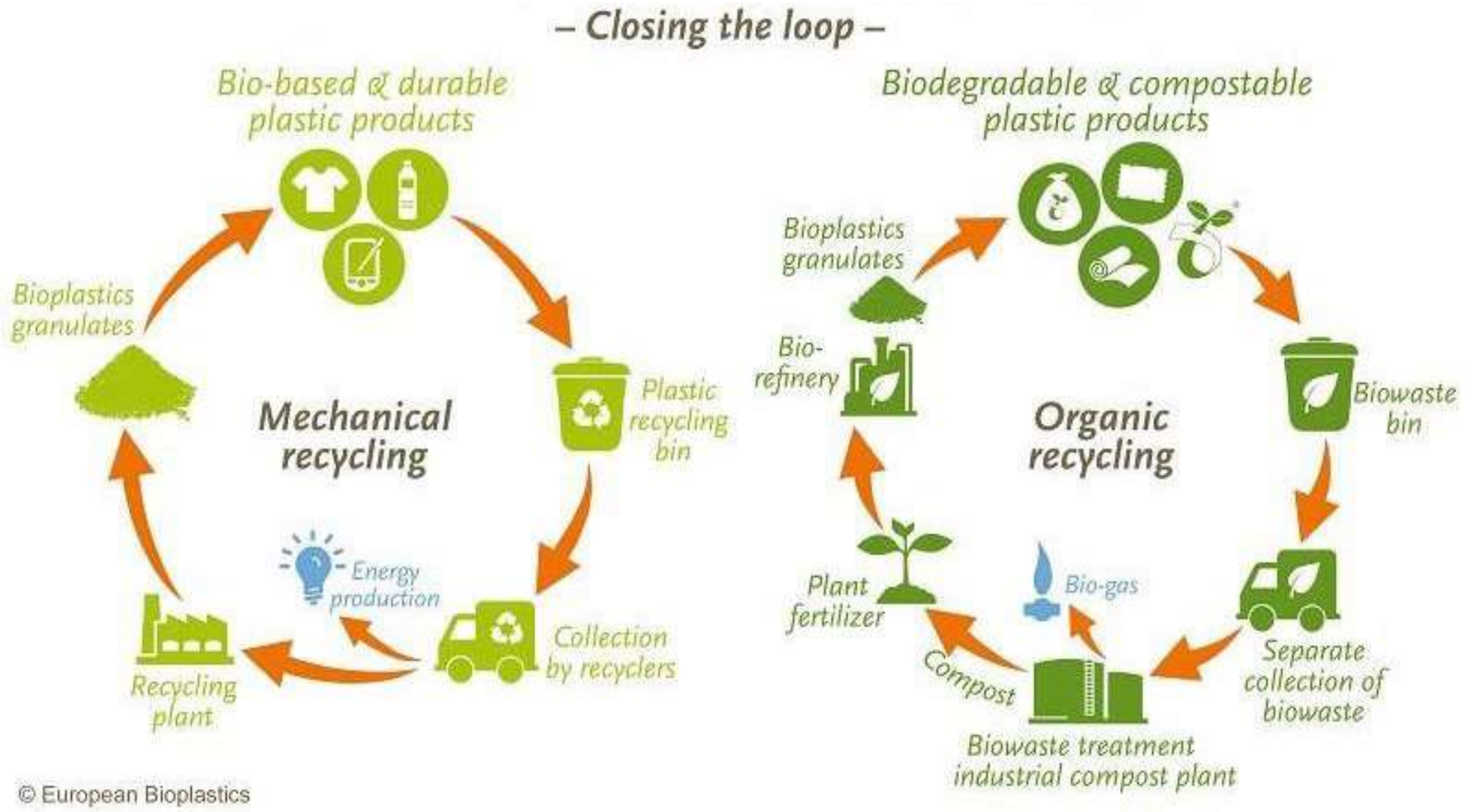


- Biodegradation impossible
- Disposal to landfill
  (prohibited in some European countries)
- Incineration (not appropriate due to the high content of water in organic waste)

What is Compostability?

- Bio-Compostable polymer
- Undergoes degradation by biological processes during composting.
- Yield CO_2, water, mineral salts & new biomass.
- Leave no visible, distinguishable or toxic residue.

End-of-life options for Biopolymers



Bio-based and Bio-compostable Polymers for Sustainable Tomorrow…

EcoFlex in Comparison with Conventional Plastics

EcoFlex is comparable to PE

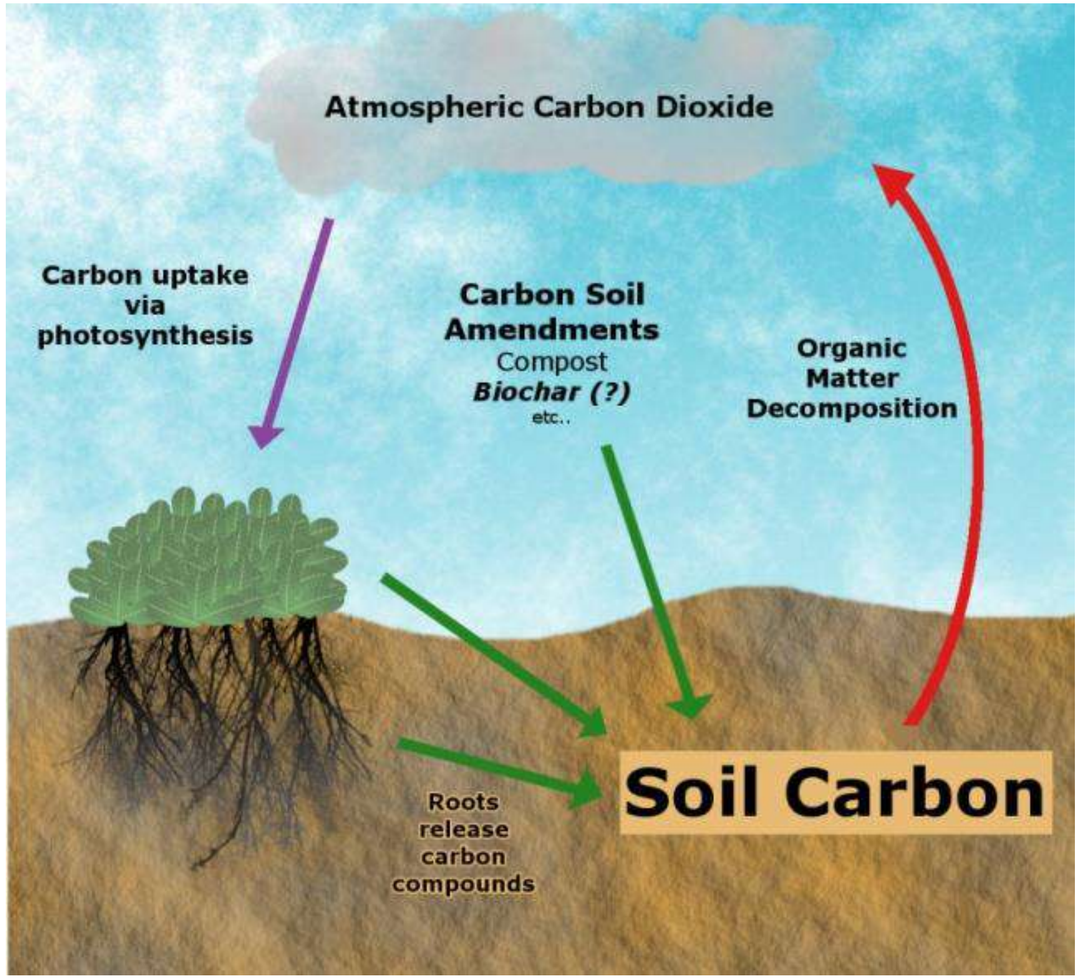
EcoFlex is comparable to PP

EcoFlex has higher barrier compared to Wood pallet Composites

EcoFlex is transparent

Agricultural Applications using Biopolymers

- Mulching
- Nursery bags
- Safety covers
- Poly house Film/ Cover Film/ Silage Film
- Clamps & Fasteners in Horticulture



Biodegradability - Enriches the organic matter

BLOOMFLEX
FLEXIBLE PACKAGING SOLUTIONS • SHORT RUNS

Compostable Mulch Film

An ideal alternative for a sustainable agriculture

To be a very competitive alternative to polyethylene mulch, biodegradable bioplastic mulch must……

- Maintain a conducive microclimate for plant growth
- Be flexible to allow mechanical installation
- Remain intact during the majority of the cropping season
- Undergo complete degradation after soil incorporation or composting
- Have no adverse impact on the environment and
- Should be cost effective/ economical.

Plastic Mulch Film: Risk of Air/ Land Pollution & Infertile Land

- Increased accumulation in rural areas.
- Too thin and usually heavily contaminated by soil and foreign materials hence difficult to recycle.
- Wrong disposal practices- Mostly burying in the soil/ burning/ disposing them at the open fields or in landfills with serious negative consequences for the environment.
- The cost of removing from the soil and cleaning this material is prohibitively high so mostly goes inside the soils & remains as it is for hundreds of years.
- Use as alternative fuel for energy recovery by incineration is very costly practice hence not practical.
- Reduced production, polluted soil: The real price of PE-based mulch films…..
- The disposal of polyethylene mulches raises many concerns. In 2004, 143,000 tons of plastic mulch were disposed of in the U.S., either in the landfill or burned on site. This amount of plastic mulch, measuring four feet wide and 1 mil thick, would wrap around the earth over 100 times

Conventional Plastic V/s Compostable Plastic Mulch

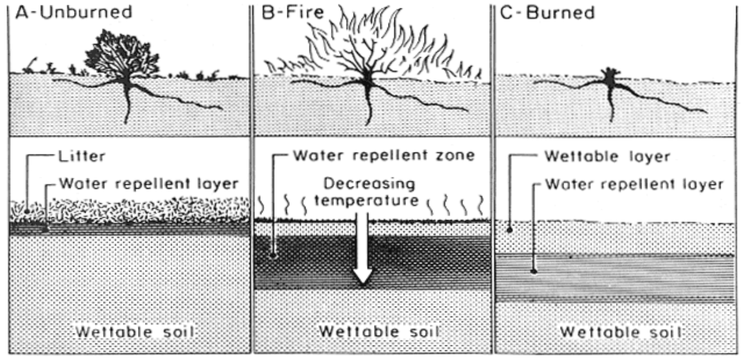
Air Pollution & Environmental Damage

Burnt

Biodegrades | Composts in Biomass

Conventional Plastic V/s Compostable Plastic Mulch

Land Pollution & Impact on Fertility



Effect on soil:
Increase in water repellent layer

Gradual reduction of soil fertility over the period

Doesn’t need to be removed after the crop cycle.

In Soil, fully converted by microorganisms in water, CO_2 and biomass, without leaving any harmful plastic residues.

Conventional Plastic V/s Compostable Plastic Mulch

Labour

Labour intensive

Manual removal

No Labour Required

Ploughing

Reduced production, polluted soil: The real price of PE-based mulch films.

Compostable Mulch Film

- Easily processable on conventional Blown Film Extrusion plants without any modification.
- Do not biodegrade too quickly during their protective life on the surface of the field.
- However, they do biodegrade steadily once ploughed into the soil after use.
- Do not affect fertility of soil. In fact bio-composts & increases the fertility of soil.
- Less sensitive to humidity in turn variation of weather, making it therefore more durable

Highlights -Biodegradable & Compostable Mulch film from EcoFlex

- Stable while use, good disintegration in soil after ploughing under.
- Cost-efficiency: No recollection and disposal of the film, reduction of thickness.
- Superior water resistance.
- High strength and tear resistance.
- High weed suppression.
- Preserve the nutrients and humidity of the soil

Highlights -Biodegradable & Compostable Mulch film from EcoFlex

- Earliness of fruits due to increased soil temperature.
- Do not produce toxic & nonbiodegradable plastic waste after usage.
- Their installation is standard procedure and does not require special machinery
- Wide range of applications for various crops and climate conditions.
- It reduces overall greenhouse gas emissions. Saves over 500 kg of CO_2 equivalent per hectare of mulch

Compostable mulch film

Mulch is used in commercial crop production

Planting

After 11 days

After 80 days

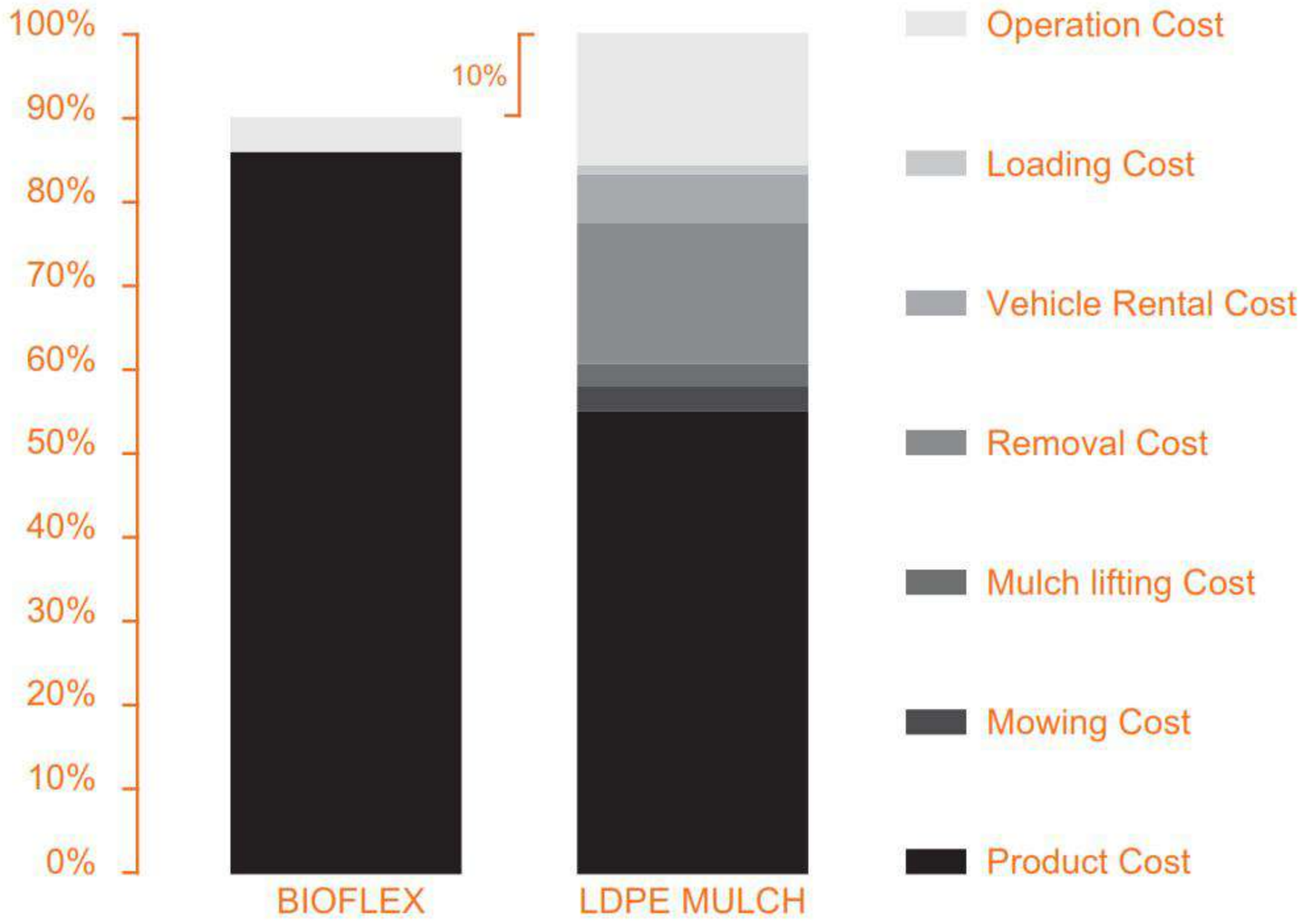
After 90 days

Advantages of using EcoFlex mulch film

- Improved agricultural production.
- Increased financial return to farmers.
- Improved environmental management.
- Certified for biodegradability & Compostability as per EN 13432/ ASTM D 6400/ IS 17088.

All the Facts

COST COMPARISON: EcoFlex VS. LDPE MULCH

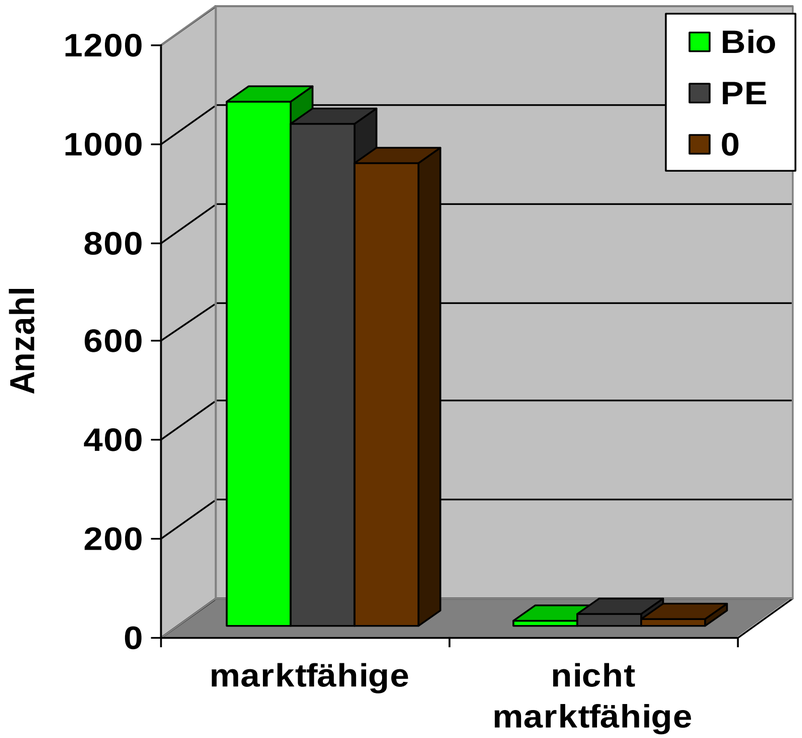


Study done by FKuR GMBH, Germany on Compostable Mulch film

3 Variants – PE, Bio, Uncovered floor; On 18 Plants & for 12 weeks

Fruit yield -

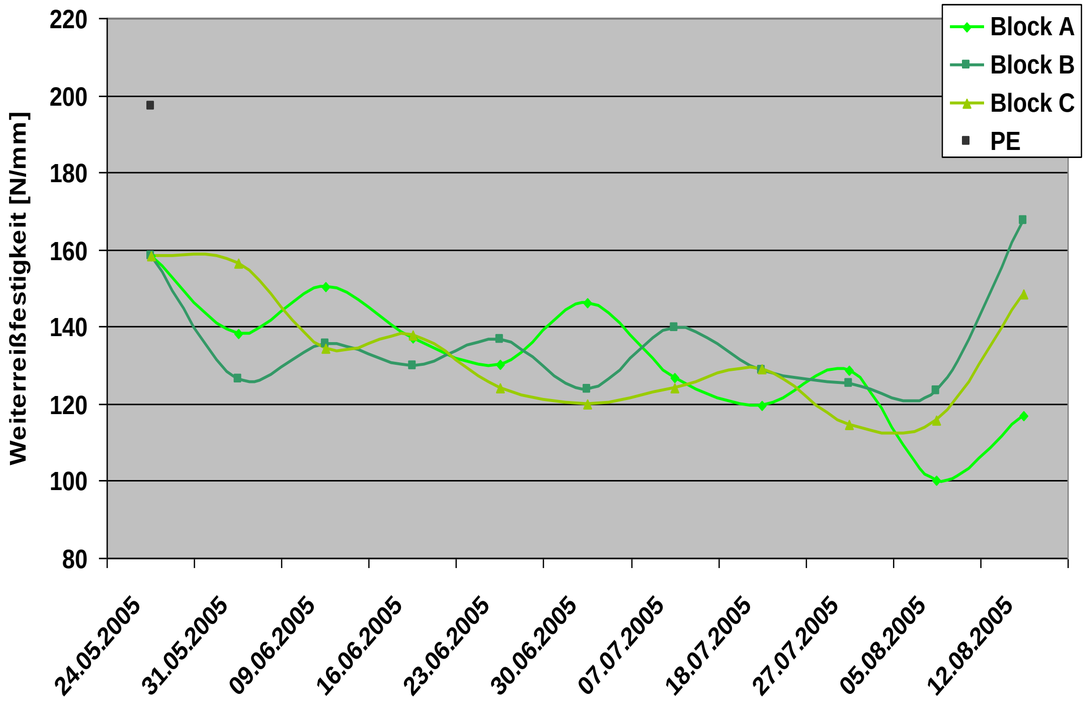
Number of fruits from 18 crops



10% Better Yield

Tear resistance -

depending on the use time



Continuous retention of tear strength

Summary

Conventional plastic mulch film

- Accumulation in the soil affects the fertility.
- Reduction in crop yield.
- Environmental and Land pollution.

Biodegradable mulch film

✓Sustainable & Eco-friendly alternative.

✓Retain the fertility of soil.

✓Cost and time effective solution – No recollection & Disposal of the film.

- Conventional Plastic mulch films cause a considerable waste disposal problem. Perhaps a major limitation to commercial uses of plastic mulches is the disposal of the plastic film after use, which causes an environmental pollution problem.
- Thus, EcoFlex compostable mulch films supports a sustainable agriculture in a world of growing food demands by conserving soils and increasing crop yields.

European Parliament supports use of biodegradable mulch film

6 November 2017

European Parliament supports use of biodegradable mulch films

Amendments acknowledge the innovative potential of biodegradable mulch films to provide positive agronomical effects and to help avoid the accumulation of microplastics on fields

Berlin, 24 October 2017 – Today, the Plenary of the European Parliament voted in favour of supporting biodegradable mulch films in the revision of the EU Fertilizers Regulation. European Bioplastics (EUBP), the association for the bioplastics industry in Europe, welcomes the outcome. "The inclusion of biodegradable mulches in the EU Fertilizers Regulation will help to harmonise regulations across the EU Member States and to create a single market for bio-based and biodegradable materials used in agriculture", says François de Bie, Chairman of EUBP.

The amendments, which have already been approved by the Parliament's Committees on Internal Market and Consumer Protection (IMCO), on Agriculture and Rural Development (AGRI), and on the Environment, Public Health and Food Safety (ENVI) in July earlier this year, acknowledge the innovative potential of biodegradable mulch films to provide positive agronomical effects and to help avoid the accumulation of microplastics on fields.

United States allows use of biodegradable mulch film

United States Department of Agriculture
Agricultural Marketing Service
National Organic Program

1400 Independence Avenue S.W.
Room 2648-South Building
Washington, DC 20250

Policy Memorandum

To: Stakeholders and Interested Parties

From: Miles V. McEvoy, Deputy Administrator
National Organic Program

Subject: Biodegradable Biobased Mulch Film

Date: Approved on January 22, 2015

This policy is directed at certifying agents and material evaluation programs that are reviewing biodegradable biobased mulch film products for compliance with the USDA organic regulations (7 CFR part 205).

On October 30, 2014, the USDA organic regulations were amended to allow the use of biodegradable biobased mulch film in organic crop production (79 FR 58655). The term "biodegradable biobased mulch film" was added to sections 205.2 and 205.601 of the USDA organic regulations. The National Organic Program (NOP) has received questions from certifiers and material evaluation programs regarding interpretation of the term "biobased" in evaluating products for compliance. This policy memorandum clarifies how certifying agents and material evaluation programs should review the biobased requirement for these products.

More sustainable agriculture for future generations..

- Technological innovations take giant steps and seek to reduce the usage of traditional agricultural plastics not only for the benefit of farmers and their crops but also to comply with rapidly changing Legislations.

- Shrinking agricultural land due to industrialization and urbanization have compelled farmers to produce more in the same land holding. Hence, farmers are using biodegradable mulch films in large numbers owing to its lower impact on environment

- Despite the higher costs implied in using this type of biodegradable films, more and more farmers prefer these new technologies that not only offer the same results as to quality and yield of their crops, but also contribute to respect the environment.

Thus enforce a more sustainable agriculture for future generations!

Global Biodegradable Mulch Film Market..

- Rapid growth of biodegradable mulch film market is driven by the harmful effects caused by use of plastic mulch film on the environment & stringent government regulations being adapted by various governments.

- However higher cost of compostable mulch film restricts the market growth.

- Nevertheless, growing global population, resulting in high demand for crop production; increasing awareness for organic farming & environmental concerns is expected to offer growth opportunities for compostable mulch film.

- In recent years, the share of biodegradable plastic film in the mulching film market has continuously increased and currently exceeds 10% in Japan and Europe

- The global Biodegradable mulch film market is registering a CAGR of 7.95% during 2019-2025.

- The global biodegradable mulch film market is expected to be around USD 52.43 Million by 2021 & expected to reach USD 64.3 Million by 2024.

- Asia Pacific is expected to witness the highest growth rate in the global biodegradable mulch film market owing to increased demand for crop production from economies such as China, India, south Korea & other

- Asia Pacific region would register a CAGR of 9.9% during 2019-2025.

- The biodegradable mulch film market in India is anticipated to be the most lucrative market for manufacturers soon, owing to growing awareness & increased population leading to increased demand for quality food.

Major Biodegradable Mulch Film Markets..

Europe • Germany • UK • France • Italy • Russia • Rest of Europe.	**Asia Pacific** • China • India • Australia • Japan • South Korea • Rest of Asia-Pacific
North America • US • Canada • Mexico	**LAMEA** • Brazil • Argentina • South Africa • Rest of LAMEA

Nursery/ Grow bags

Banana

Tree Species

- Biodegradable and 100% Compostable.
- No need to discard bag during transplantation
- Good breathability gives proper air and moisture for root development.

Polyethylene Nursery/ Grow bags

- Thrown out in the soil or buried in agricultural land or burned after transplant because of soil stuck to the bag that makes its recycling difficult.
- Bags discarded on farms can enter waterways and cause blockage, and also suffocate aquatic creatures.
- Domestic and wild animals sometimes swallow them, with disastrous effects. The bags also serve as breeding sites for mosquitoes and other disease vectors.
- Burying the polythene bags in the soil interferes with proper water percolation and aeration of the soil imposing challenges to fertility of soil gradually.
- Burning them produces noxious smoke leading to air pollution.

Polyethylene Nursery/ Grow bags

- When a seedling is taken from the bag for transplant, there is the risk of root damage, which compromises the plant's development.
- When removed from the plastic and transplanted into the soil, the roots, which may have coiled in the bag, take longer to anchor into the ground.
- The plants that were cultivated without being removed from the polyethylene bags had root development difficulties, and the polyethylene bags showed no signs of degradation. Thus they adversely affect seedling root growth and are an environmental hazard.
- These demerits of polythene bags have prompted various governments to impose levies and taxes on their use and subsequently banning their use as Nursery/ Grow bag altogether.

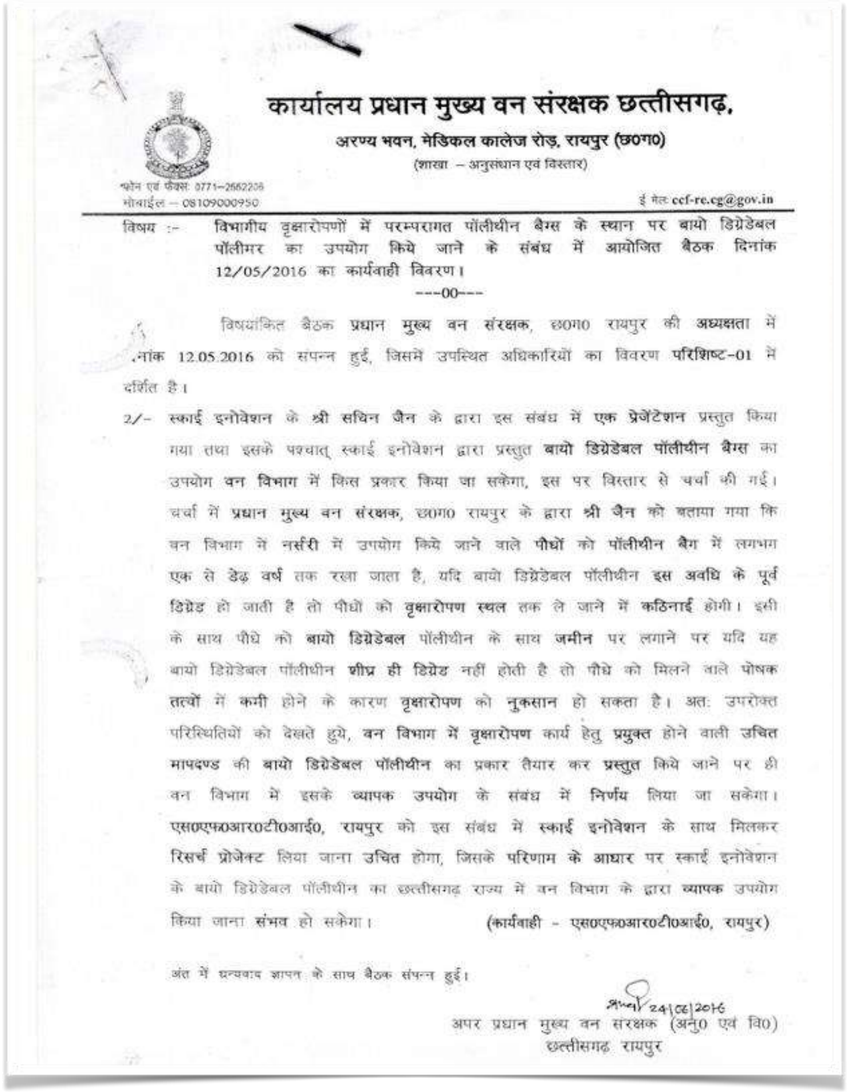
Compostable Nursery/ Grow bags

- Biodegradable and 100% Compostable. Undergoes degradation by biological processes during composting. Leaves no visible, distinguishable or toxic residue. In fact converted biomass residue acts as compost for plant & increases the fertility of soil.
- Unlike polyethylene bags, compostable bags are 100% environment friendly since it does not create any kind of soil/ air/ plastic pollution & protects nature from its irreparable hazards.
- Unlike polythene, biodegradable bags promote better drainage and aeration, which helps normal root development in the nursery. Good breathability gives proper air and moisture for root development.
- The use of biodegradable/ compostable bags is much better alternative for the production of seedling/ grow bags as these can then be transplanted directly into the soil without removing the bag, reducing the risk of damage to the roots during the moment of transplant.

Compostable Nursery/ Grow bags

- Because biodegradable bags do not have to be cut away from the roots when seedlings are transplanted, the root system remains undisturbed, which reduces the risk of transplant shock to the tree seedling.
- Thus compostable bags helps for Healthier Root System - Encourage root pruning rather than root circling
- Plants grown in compostable bags had a more fibrous root system than plants in polyethylene bags. So Seedlings/ plants produced in compostable bags will have higher growth rates.
- Controlled degradation compostable Biopolymer bags will be equally strong & durable as that of polyethylene bags. They can be produced on the same extrusion plant by adding black/ white/ green color with UV additive in it for outdoor applications.

Chhatisgarh (INDIA) Forest Department has given approval to the Biodegradable & Compostable material for Nursery/ seedling bags used by Bloomflex



कार्यालय प्रधान मुख्य वन संरक्षक छत्तीसगढ़,

अरण्य भवन, मेडिकल कालेज रोड़, रायपुर (छ0ग0)

(शाखा – अनुसंधान एवं विस्तार)

फोन एवं फैक्स: 0771-2662206
मोबाईल – 08109000950

ई मेल: ccf-re.cg@gov.in

विषय :- विभागीय वृक्षारोपणों में परम्परागत पॉलीथीन बैग्स के स्थान पर बायो डिग्रेडेबल पॉलीमर का उपयोग किये जाने के संबंध में आयोजित बैठक दिनांक 12/05/2016 का कार्यवाही विवरण।

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विषयांकित बैठक **प्रधान मुख्य वन संरक्षक**, छ0ग0 रायपुर की **अध्यक्षता** में **दिनांक 12.05.2016** को संपन्न हुई, जिसमें उपस्थित अधिकारियों का विवरण **परिशिष्ट-01** में दर्शित है।

2/- स्काई इनोवेशन के **श्री सचिन जैन** के द्वारा इस संबंध में **एक प्रेजेंटेशन** प्रस्तुत किया गया तथा इसके पश्चात् स्काई इनोवेशन द्वारा प्रस्तुत **बायो डिग्रेडेबल पॉलीथीन बैग्स** का उपयोग **वन विभाग** में किस प्रकार किया जा सकेगा, इस पर विस्तार से चर्चा की गई। चर्चा में **प्रधान मुख्य वन संरक्षक**, छ0ग0 रायपुर के द्वारा **श्री जैन** को बताया गया कि वन विभाग में **नर्सरी** में उपयोग किये जाने वाले **पौधों** को **पॉलीथीन बैग** में लगभग एक से **डेढ़ वर्ष** तक रखा जाता है, यदि बायो डिग्रेडेबल पॉलीथीन **इस अवधि** के पूर्व **डिग्रेड** हो जाती है तो पौधों को **वृक्षारोपण स्थल** तक ले जाने में **कठिनाई** होगी। इसी के साथ पौधे को **बायो डिग्रेडेबल** पॉलीथीन के साथ **जमीन** पर लगाने पर यदि यह बायो डिग्रेडेबल पॉलीथीन **शीघ्र ही डिग्रेड** नहीं होती है तो पौधे को मिलने वाले **पोषक तत्वों** में **कमी** होने के कारण **वृक्षारोपण** को **नुकसान** हो सकता है। अतः उपरोक्त परिस्थितियों को देखते हुये, **वन विभाग में वृक्षारोपण** कार्य हेतु **प्रयुक्त** होने वाली **उचित मापदण्ड** की **बायो डिग्रेडेबल पॉलीथीन** का प्रकार तैयार कर **प्रस्तुत** किये जाने पर ही वन विभाग में इसके **व्यापक उपयोग** के संबंध में **निर्णय** लिया जा सकेगा। **एस0एफ0आर0टी0आई0, रायपुर** को इस संबंध में **स्काई इनोवेशन** के साथ मिलकर **रिसर्च प्रोजेक्ट** लिया जाना **उचित** होगा, जिसके **परिणाम के आधार** पर स्काई इनोवेशन के बायो डिग्रेडेबल पॉलीथीन का छत्तीसगढ़ राज्य में वन विभाग के द्वारा **व्यापक** उपयोग किया जाना संभव हो सकेगा। **(कार्यवाही - एस0एफ0आर0टी0आई0, रायपुर)**

अंत में धन्यवाद ज्ञापन के साथ बैठक संपन्न हुई।

24/08/2016

अपर प्रधान मुख्य वन संरक्षक (अनु0 एवं वि0)
छत्तीसगढ़ रायपुर

Safety Covers

Covers open for Aeration/ With Holes

Biodegradable (Breathable)

Biocompostability Certificates

BLOOMFLEX
FLEXIBLE PACKAGING SOLUTIONS • SHORT RUNS

EN 13432

DIN CERTCO
Gesellschaft für Konformitätsbewertung mbH

REGISTRIERBESCHEID

Der Firma

FKuR Kunststoff GmbH
Siemensring 79
47877 Willich

wird für das Produkt

Kompostierbare Werkstoffe

vom Typ

Bio-Flex F 1130

die Konformität mit

DIN EN 13432:2000-12
Zertifizierungsprogramm Produkte aus kompostierbaren Werkstoffen
(Stand: 2006-08)

bestätigt.

Registernummer: 7W0042

Dieser Registrierbescheid ist in Verbindung mit der oben genannten Registernummer unbefristet gültig und wird mit der Kündigung unwirksam.

Weitere Angaben siehe Anhang
DIN CERTCO Gesellschaft für Konformitätsbewertung mbH
Alboinstraße 56, 12103 Berlin

2008-09-18
Dipl.-Ing. Dipl.-Wi.-Ing. Sören Scholz
- Leiter der Zertifizierungsstelle -

OK compost VINÇOTTE

...ARDING AND USE OF THE ...CONFORMITY MARK
...O 05-073-B
...the certificate N° O 05-073-A)
...NÇOTTE International

...2 (09-2000) : - Packaging - Requirements for packaging recoverable ... composting and biodegradation – Test scheme and evaluation criteria for ... acceptance of packaging –
... Program with reference OK 1 edition D
...ober 2006 till 28 July 2010
... comply with the above mentioned certification criteria, as confirmed by the ... AVI no C 09 99 221 / 35 07 221p.
...ation followed by supervision through verification tests on samples from the ...stocks.
...ity of the product is guaranteed by the procedures for awarding and use of ...mpost' conformity mark. This only applies for specimen bearing the ... mark.

Brussels, 16 October 2006

Petra MICHIELS
Contract Manager

For the Certification Committee
Philippe DEWOLPS
President of the Committee

Annex : /

V-CERTOKC-e

ASTM D6400

CERTIFICATE

THIS ...
the specificati...
ASTM D6400, ...
terms and con...
Composting C...
Program Rule...

Products
- Bio-Fle... a maxi...
- Biogra... a maxi...
- Bio-Fle... maxim...

as further des...
Biodegradable ...
Germany.

This Certificat...
use the Certif...
all conditions ...
Biodegradable ...

NFU 52001

SERP BIO

Siège Social et Trésorerie:

Professeur Yves Grohens
Laboratoire L2PIC
Université de Bretagne Sud
Rue Saint Maudé
56325, Lorient Cédex.-

Certificat de conformité d'un matériau à la norme NFU 52001

En date du 31 mai 2006, la Société FKuR Kunststoff GmbH Siemensring, 79 - 47877 Willich – Allemagne (*par l'intermédiaire de son représentant Monsieur M. Dilmans Matthew, Ingénieur, Sales Manager Benelux, France*) a demandé à l'Association SERPBIO de bien vouloir procéder à une recherche d'adéquation à la norme NFU 52001 d'un échantillon de film Biomulch Film Bioflex V219F

Sur la base des rapports d'analyses des laboratoires suivants:

ISEGA – Forschungs und Untersuchungs Gesellschaft mbH Aschaffenburg (Allemagne)
IUSE – Fraunhofer Institut Umwelt, Sicherheits, Energietechnik Umsicht
MFPA – Weimar Universität
DIN CERTCO conformitate certificate to DIN EN 13432 (compostabilité en conditions industrielles)
Laboratoire de Chimie Moléculaire et Thio-organique de l'Université de Caen
Laboratoire du Centre de Génie Industriel de Ploemeur
Laboratoire Nature for Innovative & Sustainable Solutions (Natives) de Ath en Belgique

SERPBIO constate que le matériau testé est en adéquation avec la norme NFU 52001 et peut donc être qualifié de biodégradable par enfouissement dans le sol.

Fait à Lorient le 01 mars 2007

Le Président	Le Vice-Président	La Secrétaire	Le Vice-Secrétaire	Le Trésorier
Ing. Guy César	Prof. Dr Pierre-Jean Madec	Maître de Conférences Dr Isabelle Dez	Maître de Conférences Dr Ludovic Benguigui	Prof. Dr Yves Grohens

Membre du COBIO (Comité Français pour la Biodégradabilité)
Membre du BBP (Belgian Bio Packaging)

compostable

OK compost AIB VINÇOTTE

COMPOSTABLE Biodegradable Products Institute US COMPOSTING COUNCIL TM

Komposterbar
Anbefalt av NRF
Reg. nr. 001

グリーンプラ®
生分解性プラスチック

Thank you

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plastics - made by nature!®

Bio-based and Bio-compostable Polymers for Sustainable Tomorrow…

Bio-based and Bio-compostable Polymers for Sustainable Tomorrow…